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GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MANUAL

VOLUME I

PROGRAM "KRASH" THEORY

Max A. Gamon

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Final Report

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16. Abstract

This document provides a comprehensive description of program KRASH, as modified under Contract DOT-FA75-WA-3707. Included in this User's Manual are the following sections.

1. Program KRASH (Description and Theory)
2. Program Controls and Listing.

v.3-A054 266

The User's Manual is part one of a three-volume document. The second volume describes modeling techniques applicable to program KRASH to assist in the development of improved structural crashworthiness designs, as well as the detailed input requirements and output capabilities of KRASH. Volume III contains general background data regarding structural crashworthiness design. Each volume has been established in such a manner that they can readily be updated as more data becomes available. The subject matter contained within each section can be expanded or revised, as necessary, without affecting the other sections. Each section contains its own numbering system which facilitates the task of updating the document.

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METRIC CONVERSION FACTORS

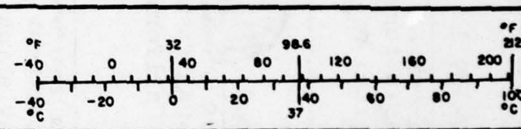
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



FOREWORD

This report was prepared by the Lockheed-California Company under contract DOT-FA75-WA-3707. The report contains a partial description of the effort performed as Task II of a three task effort. The Task II report covers the period from July 1976 to December 1977. The work was administrated under the direction of the Federal Aviation Administration with H. Spicer acting as Technical Monitor.

The project leader was Gil Wittlin of the Lockheed-California Company. Important contributions were made to the program by the Cessna Aircraft Company under the direction of D.J. Ahrens and W.B. Bloedel. M.A. Gamon and W. L. LaBarge participated in the development of the User's Manual. The Lockheed effort was supervised by J.E. Wignot (Dynamics Loads Group) and R.F. O'Connell (Aeromechanics Department).

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SUMMARY

This document provides a comprehensive description of program KRASH, as modified under Contract DOT-FA75-WA-3707. Included in this User's Manual are the following sections:

1. Program KRASH; Description and Theory
2. Program Controls and Listing

The User's Manual is part one of a three-volume document. The second volume describes modeling techniques applicable to program KRASH to assist in the development of improved structural crashworthiness designs, as well as the detailed input requirements and output capabilities of KRASH. Volume III contains general background data regarding structural crashworthiness design. Each volume has been established in such a manner that they can readily be updated as more data becomes available. The subject matter contained within each section can be expanded or revised, as necessary, without affecting the other sections. Each section contains its own numbering system which facilitates the task of updating the document.

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LIST OF SYMBOLS

$[A_\beta]$	Rotation transformation matrix from ground axes to slope axes
A_i, B_i, C_i	Terms used in Euler's Equations of motion (1-112)
$[A_i]$	Rotation transformation matrix from body axes to ground axes
$[\overline{A}_i]$	Matrix relating $(\dot{\phi}, \dot{\theta}_i, \dot{\psi}_i)$ to (p_i, q_i, r_i) in Equation (1-153)
$[\dot{A}_i]$	Time derivative of $[A_i]$
$[A_i'']$	Rotation transformation matrix from ith body axes to cg axes
A_{ij}	Cross-sectional area for beam ij
$[A_{ij}]$	Rotation transformation matrix from beam ij axes to ground axes
$[A']$	Rotation transformation matrix from cg axes to ground axes
[AIJTAI]	Rotation transformation matrix from mass i axes to beam axes
[AIJTAJ]	Rotation transformation matrix from mass j axes to beam y axes
$(ax, ay, az)_i$	Translational acceleration components of mass m_i, body axes
CE	External spring crushing energy
$\overline{C}_{ij}$	Damping ratio for beam ij (actual damping/critical damping)
C_{ik}	End point of kth spring of ith mass
C'_{ik}	Ground contact point of kth spring on ith mass

C_k	Damping contact $2\xi_{ij}/\omega_k$
$(d_1, \ldots, d_6)_{ij}$	Incremental relative beam deflections and rotations (j - i)
$(d_7, d_8, d_9)_{ij}$	Incremental beam rotation sums (j + i)
[D']	Derivative matrix used in Equation (1-149)
DE	Damping energy
$DELG_{iKM}$	Ground deflection beneath spring iKM
$\{dF_i\}$	$(dFx, dFy, dFz, dM\phi, dM\theta, dM\psi)_i$
$\{dF_i'\}$	Incremental nonlinear strain forces and moments at beam end i
$(dFx, dFy, dFz)_i$	Incremental linear strain forces at beam end i
$[D_i]$	Derivative matrix used in Equation (1-3)
$(dM\phi, dM\theta, dM\psi)_i$	Incremental linear strain moments at beam end i
$(dpin, dqin, drin)_i$	Incremental rotation of mass m_i, body axes
DRI	Dynamic Response Index
dvc_{ijk}	Ground axes components of vector from m_i to C_{ik}
dvc'_{ijk}	Ground axes components of vector from C'_{ik} to C_{ik}
$dvcs\ell_{ijk}$	Slope axes components of vector from m_i to C_{ik}
$dvcs\ell'_{ijk}$	Slope axes components of vector from C'_{ik} to C_{ik}
$\{dv_i\}$	$(dx, dy, dz, d\phi, d\theta, d\psi)_i$
$(dx, dy, dz)_i$	Incremental changes (over time) of ground coordinate of mass m_i. Also used as incremental beam deflections of beam end i, beam axes.
$(dxmod, dymod, dzmod)_i$	Incremental changes (over time) of ground coordinates of i end of beam ij
$(dxup, dyup, dzup)_{iM}$	Incremental changes (over time) of ground coordinates of node point iM
$(dx', dy', dz')_i$	Incremental deflections of mass m_i, body axes

$(d\phi, d\theta, d\psi)_i$	Incremental rotations of beam end i, beam axes
E_{ij}	Modulus of elasticity for beam ij
E_{TOT}	Total system energy
$\{FD_i\}$	Damping forces and moments at beam end i
FE	Friction energy
fg_{ikM}	Ground flexibility for spring ikM
$\{F_i'\}$	Total (over time) nonlinear strain forces and moments at beam end i
$Fplow_{ik}$	Plowing force for external spring ik
$\{FS_i\}$	Total strain plus damping forces and moments at beam end i, beam axes
$\{FS_i'\}$	Total strain plus damping forces acting on mass m_i, mass axes
FSP_{ijk}	Body i axes components of spring force at ground contact point C_{ik}'
$FSPO_{ik}$	Axial compressive force in kth spring on ith mass
$\overline{FSPO}_{ik}$	Value of $FSPO_{ik}$ at time of loading reversal
$FSPOI_{ik}$	Value of $FSPO_{ik}$ in first nonlinear region
$FSPOF_{ik}$	Value of $FSPO_{ik}$ in second nonlinear region
G	Center-of-gravity of total vehicle
G_{ij}	Modulus of rigidity for beam ij
H	Origin of airplane coordinate system (F.S.O, B.L.O, W.L.O)
He_{xi}, He_{yi}, He_{zi}	Angular momenta of m_i due to rotation of masses internal to m_i
$[I_i]$	Inertia matrix for mass m_i
$(inp, inq, inr)_i$	Time integral of $(p, q, r)_i$, angular velocity components of m_i

I_{xi}, I_{yi}, I_{zi}	Moments of inertia of lumped mass m_i, about ith body fixed axes
I_{xyi}, I_{yzi}, I_{zxi}	Products of inertia of lumped mass m_i, about ith body fixed axes
$I_{y_{ij}}$, $I_{z_{ij}}$	Area moments of inertia for beam ij
J_{ij}	Torsional stiffness factor for beam ij
KE	Kinetic energy
ke_{ik}	Linear bottoming stiffness for external spring ik
$[K_{ij}]$	Linear stiffness matrix for beam ij
$[KR_{ij}]$	Six by six diagonal stiffness reduction matrix for beam ij
$(k_x, k_y, k_z, k_\phi, k_\theta, k_\psi)_{ij}$	Diagonal elements of stiffness matrix for beam ij
$(k_{y\psi}, k_{z\theta})_{ij}$	Coupled bending elements of stiffness matrix for beam ij
l_{ci}	Aerodynamic lift constant
$LIFT_i$	Aerodynamic lift on m_i, positive up, in ground axes
l_{ij}	Length of beam ij
l_{ik}	Length of vector from m_i to ground contact point C'_{ik}
$\bar{l}_{xi}$, $\bar{l}_{yi}$, $\bar{l}_{zi}(\bar{l}_{ik})$	Free length of kth spring on ith mass
m_i	ith lumped mass
mu_{ik}	Ground-spring friction coefficient for kth spring on ith mass
N, NM	Total number of lumped masses
$\bar{n}_{ik}$	Unit vector triad fixed in ith body coordinate system
$\bar{n}_x$, $\bar{n}_y$, $\bar{n}_z$	Unit vector triad fixed in ground coordinate system
O	Origin of ground coordinate system

p', q', r'	c.g. axes components of initial (t=0) vehicle angular velocity vector
PE	Potential energy
p_i, q_i, r_i	ith body axes components of absolute angular velocity vector of mass i
Q	Beam sectional shape factor relating torsional shear stress to applied moment
r_{xi}, r_{yi}, r_{zi}	Distances from airplane cg to m_i, airplane axes
$(rx, ry, rz)_{iM}$	Body axes components of vector from mass m_i to node point iM
SE	Strain energy
SI, SA, SB, SF	Input constants defining transition points in external spring load-deflection curve for spring ikM
SIFL, SAFL, SBFL, SFFL	Constants defining transition points in external spring load deflections curve for spring ikM, including ground flexibility
s_{ik}	External spring axial compression, kth spring on ith mass
$\dot{s}_{ik}$	External spring axial velocity
$\bar{s}_{ik}$, SBAR	Value of s_{ik} at time of loading reversal
t	Time
$T(\omega)$	Filter transfer function
$TERM_{ij}$	Term in expression for external spring crushing energy, Equation (1-169)
$[TR_{iM}]$	Transformation matrix used in Equation (1-60)
u_i, v_i, w_i	Body i axes components of absolute translation velocity vector of mass m_i
$(umod, vmod, wmod)_i$	Body axes components of velocity of i end of beam ij
$(unp, vnp, wnp)_{iM}$	Node point velocity, body axes

$\{v\}_{ij}$	$(vx, vu, vz, v\phi, v\theta, v\psi)_{ij}$
${}^{m_i}\vec{V}^{C'}$	Velocity vector of C'_{ik} with respect to m_i
${}^{O}\vec{V}^{\bar{C}'}$	Velocity of point fixed in m_i, instantaneously coinciding with point C', with respect to ground
${}^{O}\vec{V}^{C'}$	Velocity vector of C'_{ik} with respect to ground
${}^{O}\vec{V}^{m_i}$	Velocity vector of m_i with respect to ground
va_{ij}	x_i, y_i, z_i
$\overline{vb}_{ijl}$	Value of v_{ijl} at time of loading reversal
vc_{ijk}	Ground coordinates of point C_{ik}
$v\dot{c}p_{ijk}$	Ground axes components of absolute velocity of ground contact point C'_{ik}
$v\dot{c}ps\ell_{ijk}$	Slope axes components of velocity of C'_{ik}
$vcs\ell_{ijk}$	Slope coordinates at point C_{ik}
$(vel_1, \ldots, vel_6)_{ij}$	Relative beam end velocities (j - i)
$(vel_7, vel_8, vel_9)_{ij}$	Beam end velocity sums (j + i)
$\bar{v}_{ik}$	Magnitude of ground plane contact point velocity for spring ik
$\overline{vs\ell}_{ik}$	Magnitude of slope contact point velocity of C'_{ik}
$(vx, vy, vz)_i$	Translational velocity components of beam end i, beam axes
$(vx, vy, vz)_{ij}$	Total (over time) relative beam deflections (j - i)
$(v\phi, v\theta, v\psi)_i$	Rotational velocity components of beam end i, beam axes
$(v\phi, v\theta, v\psi)_{ij}$	Total (over time) relative beam rotations (j - i)
W_i	Weight of ith lumped mass
W_{TOT}	Total vehicle weight
X_{Ai}, Y_{Ai}, Z_{Ai}	Aerodynamic forces, body i axes

$\dot{x}_{AP}, \dot{y}_{AP}, \dot{z}_{AP}$	Ground axes components of airplane cg velocity vector
$\begin{pmatrix} XC_i, YC_i, ZC_i \\ LC_i, MC_i, NC_i \end{pmatrix}$	Crash (external) forces and moments, body i axes
$(XC_{iM}, \ldots, NC_{iM})$	External spring crash forces due to all springs attached to node point iM
x_G, y_G, z_G (vg_j)	Ground coordinates of initial (t = 0) cg position
$\dot{x}_G, \dot{y}_G, \dot{z}_G$	Ground axes components of initial (t = 0) cg velocity vector
x''_G, y''_G, z''_G ($vgpp_{ij}$)	Airplane axes coordinates of vehicle cg (point G)
X_{Gi}, Y_{Gi}, Z_{Gi}	Gravity forces, body i axes
x_i, y_i, z_i (va_{ij})	Ground coordinates of m_i
$\begin{pmatrix} X_i, Y_i, Z_i \\ L_i, M_i, N_i \end{pmatrix}$	Total forces and moments on mass i, in ith body axes
x'_i, y'_i, z'_i (vip_{ij})	Coordinates of m_i in center-of-gravity coordinate system
x''_i, y''_i, z''_i ($vipp_{ij}$)	Coordinates of m_i in airplane coordinate system
$\begin{pmatrix} X_{Ii}, Y_{Ii}, Z_{Ii} \\ L_{Ii}, M_{Ii}, N_{Ii} \end{pmatrix}$	Internal (strain + damping) forces and moments, body i axes
x_{ij}, y_{ij}, z_{ij}	Ground coordinates of vector from point i to point j
$(xmod, ymod, zmod)_i$	Ground coordinates of i end of beam ij
$\begin{pmatrix} \bar{x}_n, \bar{y}_n, \bar{z}_n \\ \bar{x}_p, \bar{y}_p, \bar{z}_p \end{pmatrix}$	Mass penetration control volume dimensions

$(xnp, ynp, znp)_{iM}$	Ground coordinates of node point iM
$(\dot{x}np, \dot{y}np, \dot{z}np)_{iM}$	Node point velocity, ground axes
x_{pi}, y_{pi}, z_{pi}	pth body axes components of vector from m_p to m_i
$XVOC_{ijk}$	Ground axes components of spring force at ground contact point C'_{ik}
$XVOCSL_{ijk}$	Slope axes components of spring force at C'_{ik}
zc_{MAX}	Vertical distance from cg to lowest C'_{ik}
z_{SL}	Slope axes coordinate of initial airplane cg position
Δ_i	Determinate expression used in Equation (1-112)
Δt, dt	Numerical integration time interval
${}^{O}\vec{\omega}^{m_i}$	Angular velocity of m_i with respect to ground
ω_c	Filter cutoff frequency
ω_{ij}	Natural frequency of beam ij
ϕ', θ', ψ'	Euler angles from ground axes to cg axes (constant); initial (t = 0) attitude of vehicle
ϕ_i, θ_i, ψ_i	Euler angles from ground axes to body axes (time varying)
$\phi''_i, \theta''_i, \psi''_i$	Euler angles from cg axes to ith body axes (constant)
$\phi_{ij}, \theta_{ij}, \psi_{ij}$	Euler angles from ground axes to beam ij axes (time varying)
σ_s	Beam element shear stress
σ_{shear}	Allowable shear stress
$\sigma_{s_{max}}$	Beam element maximum shear stress
σ_x	Beam element axial stress
σ_{yield}	Beam element yield stress
σ_1, σ_2	Beam element principal stresses
ξ_{ij}	Damping ratio for beam ij

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SECTION 1

PROGRAM KRASH

1.1 INTRODUCTION

This section presents a comprehensive description of the crash analysis digital computer program called KRASH. Section 1.2 gives an outline of the general features and capabilities of the KRASH program. Section 1.3 presents in detail all the theoretical development of the equations contained in KRASH. Section 2 outlines the input-output control parameters in KRASH, and presents a simplified program flow diagram. A complete program listing is included in Appendix A.

1.2 PROGRAM KRASH DESCRIPTION

Digital computer program KRASH predicts the response of vehicles to multidirectional crash environments. The program computes the time histories of N interconnected masses, each allowed six degrees of freedom defined by inertial coordinates x_i, y_i, z_i and Eulerian angles ϕ_i, θ_i, ψ_i, where i = 1, 2...N. Euler's equations of motion are written for each mass. The equations of motion are integrated numerically to obtain velocities, displacements, and rotations. Gravitational forces, internal forces and moments, and external forces are computed. For small deflections a linear analysis is obtained, and for large deflections, general plastic deformation is allowed. The program provides for unloading and subsequent reloading along a linear elastic line.

Program KRASH describes the interaction between a series of massless interconnecting structural elements and concentrated rigid body masses to which the structural elements are attached at their ends with the appropriate end fixity (pinned, fixed). The structural elements can be connected between "node points" which are offset from and rigidly attached to selected mass points. The interconnecting elements represent the stiffness characteristics of the structure between the masses. The masses can translate and

rotate in all directions under the influence of the external forces (i.e., gravity, aerodynamic, impact), as well as the constraining internal element forces. The movement of the masses results in changes in the relative distortion of the structural elements and, in turn, results in a new set of element forces acting throughout the system.

Computer Program KRASH has the capability to:

1. Define the response of six degrees of freedom (DOF) at each representative location, including three translations and three rotations

2. Determine mass accelerations, velocities, and displacements and internal member loads and deformations at each time interval

3. Provide for general nonlinear stiffness properties in the plastic regime, including different types of load-limiting devices, and determine the amount of permanent deformation

4. Determine how and when rupture of an element takes place and redistribute the loading over the structural elements involved

5. Define mass penetration into an occupiable volume

6. Define the volume change due to structural deformations of the occupiable volume

7. Provide for ground contact by external structure including sliding friction and a nonrigid ground surface

8. Include internal structural damping

9. Include a measure of injury potential to the occupants; for instance, the probability of spinal injury indicated by the Dynamic Response Index (DRI)

10. Determine the distribution of kinetic and potential energy by mass item, the distribution of strain and damping energy by element, and the crushing and sliding friction energy associated with each external spring

11. Determine the vehicle response to an initial condition that includes linear and angular velocity about three axes and any arbitrary vehicle attitude

12. Provide a measure of the airplane cg velocity by means of translational momentum relationships.

13. Analyze an impact into a horizontal ground and/or an inclined slope.

14. Provide a measure of the internal stress state of internal beam elements

15. Analyze a mathematical model containing up to 80 masses and 100 internal beam elements

1.3 THEORY

1.3.1 Mathematical Model of Airplane

The airplane is modeled as a series of interconnected lumped masses. Each mass is allowed six degrees of freedom, three translations and three rotations. The masses are connected internally by nonlinear beam elements. Each mass is allowed up to three external nonlinear springs, which radiate outward from the mass and contact the ground, providing external crash forces. A typical airplane model is shown in Figure 1-1.

The three lumped masses, m_i, m_j and m_k, are interconnected by beams ij and jk. Three external springs are shown radiating outward from m_k. The end points of these springs are denoted by C_{xk}, C_{yk} and C_{zk}. The center-of-gravity of the entire airplane is denoted by G. (In general, there will be no lumped mass exactly at G.)

1.3.2 Coordinate Systems

The following coordinate systems are established to facilitate the derivation of equations for the mathematical model.

1.3.2.1 Ground Coordinate System (Oxyz)

This is a right-handed coordinate system fixed in the ground with origin at point O in Figure 1-1. The x axis is positive forward, the y axis positive to the right, and the z axis positive downward. The xy plane (z = 0) corresponds to the ground surface. The ground coordinate system is considered an inertial coordinate system for writing the dynamic equations of motion.

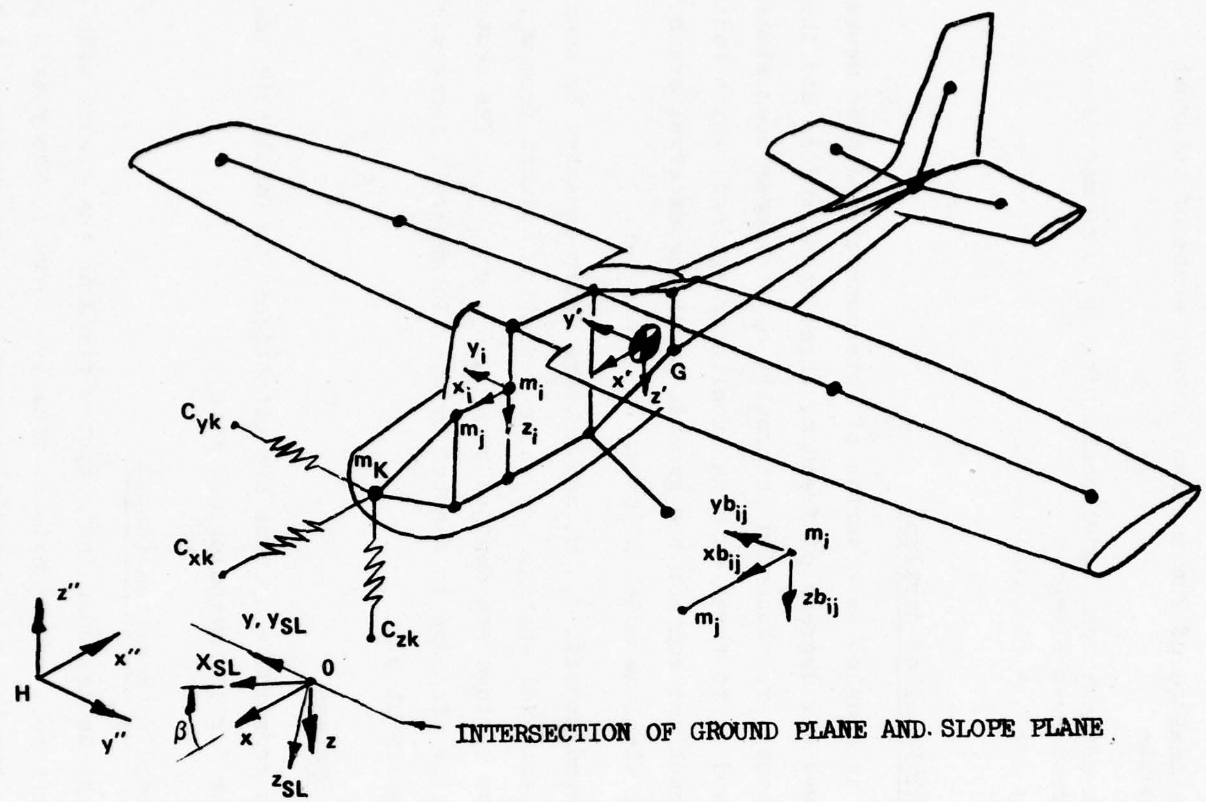


Figure 1-1. Mathematical Model of Airplane

1.3.2.2 Slope Coordinate System ($Ox_{SL}y_{SL}z_{SL}$)

This is a right handed coordinate system fixed in the ground with origin at point O as shown in Figure 1-1. The x_{SL} axis is positive forward up the slope, the y_{SL} axis is positive to the right, and the z_{SL} axis is positive perpendicular to the slope, going into the slope. This coordinate system is the same as the ground coordinate system, rotated through an angle beta (β) positive clockwise about the Oy ground axis. The $Ox_{SL}y_{SL}$ plane represents a plane inclined at an angle beta with respect to the horizontal ground plane. Beta is a constant input angle that can lie in the range from zero to ninety degrees.

1.3.2.3 Airplane Coordinate System (Hx"y"z")

This is a left-handed coordinate system fixed in the airplane with origin at point H in Figure 1-1. The x" axis is positive aft, y" is positive left, and z" is positive upward. The origin, point H, corresponds to F.S.O, B.L.O, W.L.O. This coordinate system is used only to input the coordinates of the lumped mass points, since the coordinates of the points are usually available in terms of F.S., B.L. and W.L.

1.3.2.4 Center-of-Gravity Coordinate System (Gx'y'z')

This is a right-handed system fixed in the airplane with the origin at the vehicle cg (Point G). The x' axis is positive forward, y' positive right, and z' positive downward. These axes are parallel to the Hx"y"z" axes.

1.3.2.5. Body Coordinate System ($m_i x_i y_i z_i$)

Each lumped mass has its own right-handed coordinate system fixed in the mass. The initial orientation of each of these coordinate systems is arbitrary, and it is specified by means of three input Euler angles for each mass, relating its initial orientation to the Gx'y'z' center-of-gravity coordinate system. Normally the body coordinate system is taken as initially parallel to the center-of-gravity coordinate system (and hence, the three input Euler angles are set = 0), since the inertia data is generally available about these axes.

The body coordinate system is the system used in writing Euler's equations of motion for each lumped mass m_i.

1.3.2.6 Beam Coordinate System ($m_i xb_{ij} yb_{ij} zb_{ij}$)

This is a right-handed coordinate system with the xb_{ij} axis along a straight line from m_i to m_j. As the masses move, the coordinate system changes orientation so that xb_{ij} is always pointing from m_i to m_j. If the beam connects node points which are offset from the mass points, then xb_{ij} always points from the node point rigidly attached to mass m_i to the node point rigidly attached to mass m_j.

The direction of yb_{ij} and zb_{ij} (they are mutually perpendicular) is arbitrary, and is defined internally within the program. Each beam ij has a beam coordinate system, used to compute the beam forces and moments.

1.3.3 Relations Between Coordinate Systems

Any quantity which can be expressed as a vector in one coordinate system (forces, moments, displacements, velocities, accelerations, but not large rotations) can be, likewise, specified in another coordinate system by use of an Eulerian transformation matrix relating the two coordinate systems. Thus, for example, if we have a force vector at m_i expressed in its body axes components as (X_i, Y_i, Z_i), this can be expressed in ground axes as simply

$$\begin{Bmatrix} X_{oi} \\ Y_{oi} \\ Z_{oi} \end{Bmatrix} = \left[A_i\right] \begin{Bmatrix} X_i \\ Y_i \\ Z_i \end{Bmatrix} \qquad (1\text{-}1)$$

where $\{X_{oi}, Y_{oi}, Z_{oi}\}$ are the ground axes components of the force vector and $\left[A_i\right]$ is a 3 x 3 Eulerian transformation matrix. The form of $\left[A_i\right]$ depends on the sequence in which rotations from one axis system to the other are performed. In this program, the following sequence is employed:

1. Starting with the Oxyz coordinate system, perform a clockwise (right-hand rule) rotation about the Oz axis, through an angle ψ_i.

2. Next, perform a clockwise rotation about the new Oy axis, through an angle θ_i.

3. Finally, perform a clockwise rotation about the final Ox axis, through an angle ϕ_i.

The resulting transformation matrix is then inverted to obtain a transformation from body axes to ground axes. The resulting transformation matrix is given by

$$A_i = \left[\begin{array}{c|c|c} \cos\theta_i \cos\psi_i & -\cos\phi_i \sin\psi_i + \sin\phi_i \sin\theta_i \cos\psi_i & \sin\phi_i \sin\psi_i + \cos\phi_i \sin\theta_i \cos\psi_i \\ \cos\theta_i \sin\psi_i & \cos\phi_i \cos\psi_i + \sin\phi_i \sin\theta_i \sin\psi_i & -\sin\phi_i \cos\psi_i + \cos\phi_i \sin\theta_i \sin\psi_i \\ -\sin\theta_i & \sin\phi_i \cos\theta_i & \cos\phi_i \cos\theta_i \end{array}\right] \tag{1-2}$$

Similar transformation matrices are formed to relate various other coordinate systems. These are summarized in Table 1-1.

TABLE 1-1. TRANSFORMATION MATRICES

Matrix	Transforms From	To	Using Angles	Angles Constant or Varying
$[A_i]$	ith body axes	ground axes	ϕ_i, θ_i, ψ_i	varying
$[A_{ij}]$	beam ij axes	ground axes	$\phi_{ij}, \theta_{ij}, \psi_{ij}$	varying
$[A_i'']$	ith body axes	cg axes	$\phi_i'', \theta_i'', \psi_i''$	constant
$[A']$	cg axes	ground axes	ϕ', θ', ψ'	constant
$[A_\beta]$	ground axes	slope axes	$0, \beta, 0$	constant

All the above matrices utilize equation (1-1) with the appropriate angles from Table 1-1. $\left[A''_i\right]$ and $\left[A'\right]$ are used only in initial conditions determination, so that their Euler angles are indicated as constant. These "constants" are really the time zero values of the angles which actually vary but are not used in the time history computations. ϕ', θ', ψ' are input constants defining the initial attitude of the overall vehicle.

We also will require the time derivative of the $\left[A_i\right]$ matrix, denoted $\left[\dot{A}_i\right]$. It can be shown that this is given by postmultiplying $\left[A_i\right]$ by a matrix $\left[D_i\right]$ so that

$$\left[\dot{A}_i\right] = \left[A_i\right]\left[D_i\right] \tag{1-3}$$

where $\left[D_i\right]$ is the following skew-symmetric matrix:

$$\left[D_i\right] = \begin{bmatrix} 0 & -r_i & q_i \\ r_i & 0 & -p_i \\ -q_i & p_i & 0 \end{bmatrix} \tag{1-4}$$

p_i, q_i, r_i are the body axis components of the angular velocity of mass m_i.

1.3.4 Sign Conventions

The basic sign convention used for all displacements, rotations, velocities, accelerations, forces and moments is that all quantities are positive in the positive direction of the axes shown in Figure 1-1. Rotation and moments utilize a right-hand rule to define the positive direction. The few exceptions to this rule are indicated in the theoretical development.

1.3.5 Forces Acting on Each Mass

The following forces and moments act on each lumped mass:

- Gravity forces
- Aerodynamic forces
- Internal forces and moments - Strain and Damping
- External forces and moments

All forces and moments are positive when they act in the positive direction of the $m_i x_i y_i z_i$ axes.

1.3.5.1 Gravity Forces

The gravity force for the ith lumped mass is just the weight W_i acting along the ground fixed Oz axis. Transforming this force into body axes gives the gravity forces as

$$\begin{Bmatrix} X_{G_i} \\ Y_{G_i} \\ Z_{G_i} \end{Bmatrix} = \left[A_i\right]^T \begin{Bmatrix} 0 \\ 0 \\ W_i \end{Bmatrix} \tag{1-5}$$

where $\left[A_i\right]^T$ indicates the transpose of $\left[A_i\right]$. Note that the transpose rather than the inverse is used, since for rotation transformation matrices the two are equal.

1.3.5.2 Aerodynamic Forces

The only aerodynamic forces considered are a constant lift force, in ground axes, positive upward, acting on each lumped mass. This lift force is expressed as a constant fraction of the total vehicle weight, times the vehicle weight:

$$LIFT_i = l_{c_i} W_{TOT} \qquad (1\text{-}6)$$

where

$$W_{TOT} = \sum_{i=1}^{N} W_i \qquad (1\text{-}7)$$

and N is the total number of lumped masses. Transforming this lift into ith body axes gives the desired aerodynamic forces as

$$\begin{Bmatrix} X_{A_i} \\ Y_{A_i} \\ Z_{A_i} \end{Bmatrix} = \left[A_i\right]^T \begin{Bmatrix} 0 \\ 0 \\ -\ LIFT_i \end{Bmatrix} \qquad (1\text{-}8)$$

where the minus sign is necessary because the lift is positive upward (in the negative direction of the Oz ground axis).

1.3.5.3 Internal Forces and Moments - Strain and Damping

These forces and moments result from the deformations of the interconnecting beams as the lumped masses move. First, for beam ij, the deflections, rotations and velocities of beam end points j and i are computed in beam ij axes. These are then used to calculate the three forces and three moments at point j, utilizing equations based upon the 12 x 12 stiffness matrix relating the loads to the deformations. Nonlinear effects are also included in computing the loads. The loads at point i in beam axes are computed from static equilibrium equations (the beams are assumed massless). Then the loads at i and j are transformed into ith and jth mass body axes, respectively.

Finally, for each mass the contributions from the various beams that attach to that mass are summed to obtain the total internal forces for the mass. All the internal strain force calculations are performed on an incremental basis, i.e., incremental deflections are used to compute incremental forces, since a tangent modulus is utilized for computing nonlinear effects. The damping forces are total, not incremental, based on current beam end point velocities.

1.3.5.3.1 Beam Deformations and Velocities

The first step in determining the internal beam strain and damping loads is to calculate the deflections and rotations of the end points of the beam, as well as the velocities of these points. Figure 1-2 illustrates a typical beam whose position in space is defined by the ground coordinates of the end points of the beam. This figure illustrates the most general case in which the beam connects two node points which are, in turn, rigidly connected to mass points i and j. Beams can also connect directly to the mass points. The purpose of the node points is to allow a finite size for the mass points so that beam end connections can be offset from the lumped mass center of gravity.

Masses i and j are located at (x_i, y_i, z_i) and (x_j, y_j, z_j) respectively, where these are the ground axes coordinates of m_i and m_j. These are time-varying quantities obtained from numerical integration of the equations of motion for m_i and m_j. Node points iM and jN are located at $(xnp_{iM}, ynp_{iM}, znp_{iM})$ and $(xnp_{jN}, ynp_{jN}, znp_{jN})$, respectively. These coordinates are calculated as follows

$$\begin{Bmatrix} xnp \\ ynp \\ znp \end{Bmatrix}_{iM} = \begin{Bmatrix} x \\ y \\ z \end{Bmatrix}_{i} + [A_i] \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM} \qquad (1\text{-}9)$$

$[A_i]$ is given by Equation (1-2) and is a time varying quantity dependent upon the Euler angles ϕ_i, θ_i, and ψ_i that define the orientation of mass m_i with respect to ground. The vector $(rx, ry, rz)_{iM}$ is a constant defining the

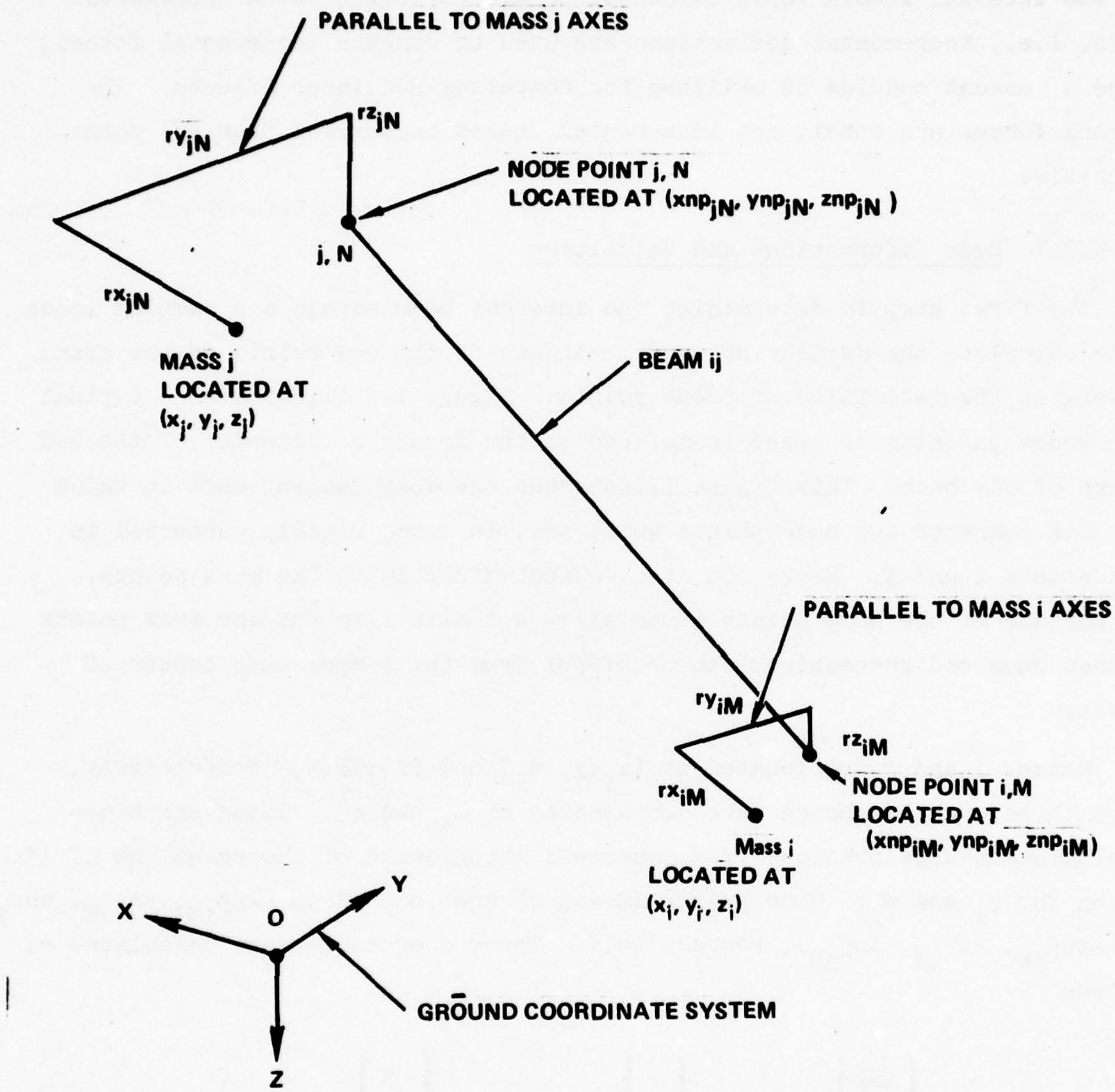


Figure 1-2. Beam End Point Locations

offset of node point iM with respect to mass m_i; these vector components are in mass-fixed axes.

Taking the time derivative of both sides of Equation (1-9) yields

$$\begin{Bmatrix} \dot{xnp} \\ \dot{ynp} \\ \dot{znp} \end{Bmatrix}_{iM} = \begin{Bmatrix} \dot{x} \\ \dot{y} \\ \dot{z} \end{Bmatrix}_i + \left[A_i\right] \left[D_i\right] \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM} \tag{1-9}$$

where Equation (1-3) has been used for $\left[\dot{A}_i\right]$. Multiplying through by the transpose of $\left[A_i\right]$ to convert from ground axes back to mass axes yields

$$\begin{Bmatrix} unp \\ vnp \\ wnp \end{Bmatrix}_{iM} = \begin{Bmatrix} u \\ v \\ w \end{Bmatrix}_i + \left[D_i\right] \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM} \tag{1-10}$$

The $(u,v,w)_i$ and $(unp,vnp,wnp)_{iM}$ are the body axes components of the velocity vectors for mass i and node point iM, respectively. The former is obtained from integration of the equations of motion.

Since the strain forces are calculated on an incremental basis, what is required are the incremental deflections of the end points of the beam. These are calculated directly as the differences between the current coordinates and the values at the previous time point.

$$\begin{Bmatrix} dx \\ dy \\ dz \end{Bmatrix}_i = \underset{\text{current}}{\begin{Bmatrix} x \\ y \\ z \end{Bmatrix}_i} - \underset{\text{previous}}{\begin{Bmatrix} x \\ y \\ z \end{Bmatrix}_i} \tag{1-11a}$$

$$\begin{Bmatrix} dxnp \\ dynp \\ dznp \end{Bmatrix}_{iM} = \underset{\text{current}}{\begin{Bmatrix} xnp \\ ynp \\ znp \end{Bmatrix}_{iM}} - \underset{\text{previous}}{\begin{Bmatrix} xnp \\ ynp \\ znp \end{Bmatrix}_{iM}} \tag{1-11b}$$

The incremental rotations are also treated as vectors. Although large rotations are not vector quantities, the incremental rotations from one time step to the next are sufficiently small to be treated as vectors. The angular velocity components of m_i are defined as $(p,q,r)_i$ in mass fixed axes. These are obtained from integration of the angular accelerations $(\dot{p},\dot{q},\dot{r})_i$. The incremental rotations are calculated as the differences (current-previous) in the integrals of the angular velocities.

$$\begin{Bmatrix} dpin \\ dqin \\ drin \end{Bmatrix}_i = \underbrace{\begin{Bmatrix} inp \\ inq \\ inr \end{Bmatrix}_i}_{current} - \underbrace{\begin{Bmatrix} inp \\ inq \\ inr \end{Bmatrix}_i}_{previous} \tag{1-12}$$

where

$$\begin{Bmatrix} inp \\ inq \\ inr \end{Bmatrix}_i = \int_o^t \begin{Bmatrix} p \\ q \\ r \end{Bmatrix}_i dt \tag{1-13}$$

The incremental rotations in Equation (1-12) are in mass-fixed axes and follow the right hand rule.

In the actual computer program KRASH, the internal beam strain and damping forces are calculated in a DO loop ranging over all the beams in the model being analyzed. For each beam, the end points are defined by mass numbers i and j and node point numbers M and N. If M or N is zero, the beam connects directly to the mass point at that end. The appropriate equations are then used to calculate the end point positions, velocities and incremental changes in position. For the remaining equations, the following terminology is employed:

$$\begin{Bmatrix} xmod \\ ymod \\ zmod \end{Bmatrix}_i = \begin{Bmatrix} x \\ y \\ z \end{Bmatrix}_i \text{ or } \begin{Bmatrix} xnp \\ ynp \\ znp \end{Bmatrix}_{iM} \tag{1-14a}$$

$$\begin{Bmatrix} dxmod \\ dymod \\ dzmod \end{Bmatrix}_i = \begin{Bmatrix} dx \\ dy \\ dz \end{Bmatrix}_i \quad \text{or} \quad \begin{Bmatrix} dxnp \\ dynp \\ dznp \end{Bmatrix}_{iM} \tag{1-14b}$$

$$\begin{Bmatrix} umod \\ vmod \\ wmod \end{Bmatrix}_i = \begin{Bmatrix} u \\ v \\ w \end{Bmatrix}_i \quad \text{or} \quad \begin{Bmatrix} unp \\ vnp \\ wnp \end{Bmatrix}_{iM} \tag{1-14c}$$

In each case, the first terms are used if there is no node point ($M = 0$ for the current beam), and the second terms are used if there is a node point ($M \neq 0$). For the angular velocities $(p,q,r)_i$ and the incremental rotations $(dpin, dqin, drin)_i$, the quantities are the same whether or not there is a node point, since the node point iM is rigidly connected to mass i. Beam end j or jN is treated in the same fashion.

Once the quantities in Equations (1-14) have been calculated, the beam orientation with respect to ground is known so that the current $[A_{ij}]$ matrix may be determined. Figure 1-3 illustrates a typical beam ij, showing its spatial orientation with respect to the ground fixed coordinate system and identifying the beam Euler angles θ_{ij} and ψ_{ij}. From Figure 1-3, it can be seen that

$$\begin{Bmatrix} xij \\ yij \\ zij \end{Bmatrix} = \begin{Bmatrix} xmod \\ ymod \\ zmod \end{Bmatrix}_j - \begin{Bmatrix} xmod \\ ymod \\ zmod \end{Bmatrix}_i \tag{1-15}$$

$$\psi_{ij} = \tan^{-1} (yij/xij) \tag{1-16a}$$

$$\theta_{ij} = - \tan^{-1} (zij/ \sqrt{xij^2 + yij^2}\ ) \tag{1-16b}$$

The remaining Euler angle ϕ_{ij}, defining the "roll" orientation of the beam axes, is initially set to zero and thereafter calculated as

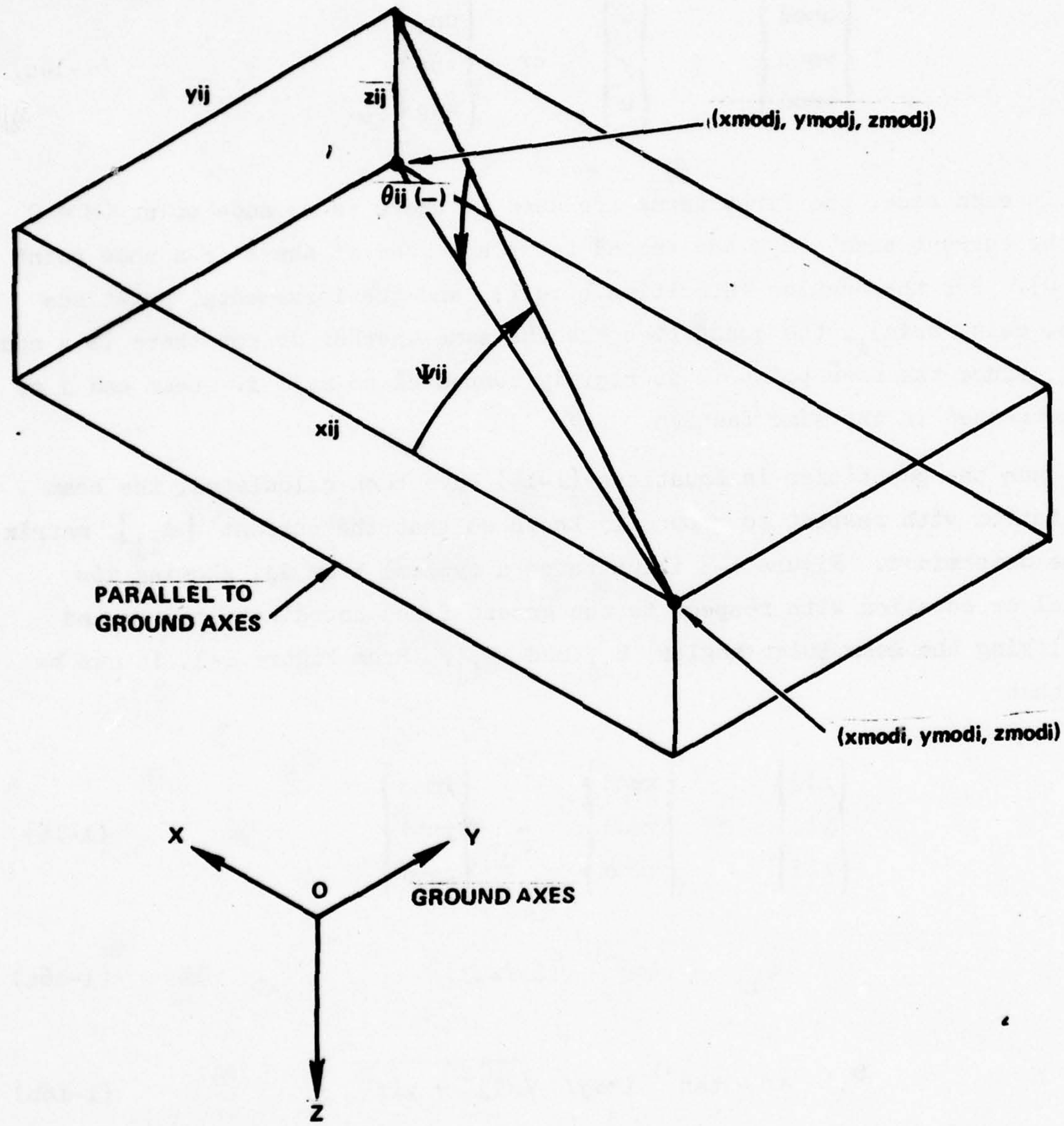


Figure 1-3. Spatial Orientation of Beam ij

$$\underset{\text{current}}{\phi_{ij}} = \underset{\text{previous}}{\phi_{ij}} + d\phi_{ij} \tag{1-16c}$$

where $d\phi_{ij}$ is the average incremental rotation of masses i and j resolved into the current beam x axis. This term is derived later, and is given by Equation (1-33). The current beam length is calculated as

$$\ell_{ij} = \sqrt{xij^2 + yij^2 + zij^2} \tag{1-17}$$

In order to transform vector quantities directly from mass fixed axes to beam axes, the following transformation matrices are calculated

$$[AIJTAI] = [A_{ij}]^T [A_i] \tag{1-18a}$$

$$[AIJTAJ] = [A_{ij}]^T [A_j] \tag{1-18b}$$

In Equations (1-18), the second matrix transforms from mass fixed axes (either i or j) to ground axes, and the first matrix transforms from ground axes to beam ij axes.

The incremental beam deflections at i and j, in beam ij axes, are given by

$$\begin{Bmatrix} dx \\ dy \\ dz \end{Bmatrix}_{i,j} = [A_{ij}]^T \begin{Bmatrix} dxmod \\ dymod \\ dzmod \end{Bmatrix}_{i,j} \tag{1-19}$$

The beam end translational velocities are simply

$$\begin{Bmatrix} vx \\ vy \\ vz \end{Bmatrix}_{i} = [AIJTAI] \begin{Bmatrix} umod \\ vmod \\ wmod \end{Bmatrix}_{i} \tag{1-20a}$$

$$\begin{Bmatrix} vx \\ vy \\ vz \end{Bmatrix}_j = [AIJTAJ] \begin{Bmatrix} umod \\ vmod \\ wmod \end{Bmatrix}_j \qquad (1\text{-}20b)$$

The incrementatl rotations of the beam ends are calculated as

$$\begin{Bmatrix} d\phi \\ d\theta \\ d\psi \end{Bmatrix}_i = [AIJTAI] \begin{Bmatrix} dpin \\ dqin \\ drin \end{Bmatrix}_i \qquad (1\text{-}21a)$$

$$\begin{Bmatrix} d\phi \\ d\theta \\ d\psi \end{Bmatrix}_j = [AIJTAJ] \begin{Bmatrix} dpin \\ dqin \\ drin \end{Bmatrix}_j \qquad (1\text{-}21b)$$

The beam end rotational velocities are

$$\begin{Bmatrix} v\phi \\ v\theta \\ v\psi \end{Bmatrix}_i = [AIJTAI] \begin{Bmatrix} p \\ q \\ r \end{Bmatrix}_i \qquad (1\text{-}22a)$$

$$\begin{Bmatrix} v\phi \\ v\theta \\ v\psi \end{Bmatrix}_j = [AIJTAJ] \begin{Bmatrix} p \\ q \\ r \end{Bmatrix}_j \qquad (1\text{-}22b)$$

1.3.5.3.2 Linear Strain Forces and Moments

The incremental beam strain forces and moments are first calculated on a linear basis and then modified by a stiffness reduction factor KR, which may vary at each time step. The calculation of the KR factors is discussed in subsection 1.3.5.3.4; this section presents the method of calculating the linear (KR=1) strain forces and moments.

The full 12 x 12 stiffness matrix for a beam element with fixed end conditions is given by Equation (1-23) below.

$$
[K] = \begin{bmatrix}
\frac{AE}{L} & & & & & & \frac{-AE}{L} & & & & & \\
 & \frac{12EI_z}{L^3} & & & & \frac{6EI_z}{L^2} & & \frac{-12EI_z}{L^3} & & & & \frac{6EI_z}{L^2} \\
 & & \frac{12EI_y}{L^3} & & \frac{-6EI_y}{L^2} & & & & \frac{-12EI_y}{L^3} & & \frac{-6EI_y}{L^2} & \\
 & & & \frac{GJ}{L} & & & & & & \frac{-GL}{L} & & \\
 & & \frac{-6EI_y}{L^2} & & \frac{4EI_y}{L} & & & & \frac{6EI_y}{L^2} & & \frac{2EI_y}{L} & \\
 & \frac{6EI_z}{L^2} & & & & \frac{4EI_z}{L} & & \frac{-6EI_z}{L^2} & & & & \frac{2EI_z}{L} \\
\frac{-AE}{L} & & & & & & \frac{AE}{L} & & & & & \\
 & \frac{-12EI_z}{L^3} & & & & \frac{-6EI_z}{L^2} & & \frac{12EI_z}{L^3} & & & & \frac{-6EI_z}{L^2} \\
 & & \frac{-12EI_y}{L^3} & & \frac{6EI_y}{L^2} & & & & \frac{12EI_y}{L^3} & & \frac{6EI_y}{L^2} & \\
 & & & \frac{-GJ}{L} & & & & & & \frac{GJ}{L} & & \\
 & & \frac{-6EI_y}{L^2} & & \frac{2EI_y}{L} & & & & \frac{6EI_y}{L^2} & & \frac{4EI_y}{L} & \\
 & \frac{6EI_z}{L^2} & & & & \frac{2EI_z}{L} & & \frac{-6EI_z}{L^2} & & & & \frac{4EI_z}{L}
\end{bmatrix}
\tag{1-23}
$$

The corresponding incremental force/deflection equation is

$$\begin{Bmatrix} dF_i \\ dF_j \end{Bmatrix} = \begin{bmatrix} K_{ij} \end{bmatrix} \begin{Bmatrix} dv_i \\ dv_j \end{Bmatrix} \tag{1-24}$$

where

$$\left\{ dv_i \right\} \triangleq \begin{Bmatrix} dx \\ dy \\ dz \\ d\phi \\ d\theta \\ d\psi \end{Bmatrix}_i \quad \text{and} \quad \left\{ dv_j \right\} \triangleq \begin{Bmatrix} dx \\ dy \\ dz \\ d\phi \\ d\theta \\ d\psi \end{Bmatrix}_j \tag{1-25}$$

The terms in Equations (1-25) are given by Equations (1-19) and (1-21). $\{dFi\}$ and $\{dFj\}$ are 6 element vectors for the forces and moments at beam ends i and j; these forces are ordered in the same manner as the deflections, i.e.

$$\left\{ dF_i \right\} \triangleq \begin{Bmatrix} dFx \\ dFy \\ dFz \\ dM\phi \\ dM\theta \\ dM\psi \end{Bmatrix}_i \quad \text{and} \quad \left\{ dF_j \right\} \triangleq \begin{Bmatrix} dFx \\ dFy \\ dFz \\ dM\phi \\ dM\theta \\ dM\psi \end{Bmatrix} \tag{1-26}$$

All quantities in these equations are in beam ij axes.

If Equation (1-24) is multiplied out using (1-23), the axial and torsional (x and ϕ) relationships are simply

$$dFx_j = k_x \left(dx_j - dx_i \right), \; dF_{xi} = -dFx_j \tag{1-27a}$$

$$dM\phi_j = k_\phi \left(d\phi_j - d\phi_i \right), \; dM\phi_i = -dM\phi_j \tag{1-27b}$$

$$k_x \triangleq AE/\ell \quad (1\text{-}28a)$$

$$k_\phi \triangleq GJ/\ell \quad (1\text{-}28b)$$

The other forces and moments consist of two sets of coupled bending equations. Deflections in the z direction and θ rotations are coupled in forming dFz and $dM\theta$, and y deflections and ψ rotations are coupled in the equations for dFy and $dM\psi$. The following relationships result from expanding Equation (1-24):

$$dFz_j = k_z(dz_j - dz_i) + k_{z\theta}(d\theta_j + d\theta_i)$$

$$dM\theta_j = k_{z\theta}(dz_j - dz_i) + \frac{k_\theta}{4}(d\theta_j - d\theta_i) + \frac{3k_\theta}{4}(d\theta_j + d\theta_i) \quad (1\text{-}29a)$$

$$dFz_i = -dFz_j$$

$$dM\theta_i = -dM\theta_j + \ell dFz_j \quad (1\text{-}29b)$$

where

$$k_z = 12EIy/\ell^3$$

$$k_{z\theta} = 6EIy/\ell^2 \quad (1\text{-}29c)$$

$$k_\theta = 4EIy/\ell$$

The corresponding equations for the coupled y, ψ motions are

$$dFy_j = k_y(dy_j - dy_i) + k_{y\psi}(d\psi_j + d\psi_i)$$

$$dM\psi_i = k_{y\psi}(dy_j - dy_i) + \frac{k_\psi}{4}(d\psi_j - d\psi_i) + \frac{3k_\psi}{4}(d\psi_j + d\psi_i) \quad (1\text{-}30a)$$

$$dFy_i = -dFy_j \quad (1\text{-}30b)$$

$$dM\psi_i = -dM\psi_j - \ell dFy_j$$

where

$$k_y = 12EIz/\ell^3$$

$$k_{y\psi} = -6EIz/\ell^2$$

$$k_\psi = 4EIz/\ell \qquad (1\text{-}30c)$$

In the above equations, E is the modulus of elasticity, G is the modulus of rigidity, ℓ is the current beam length, Iy and Iz are the beam cross-sectional area moments of inertia about the beam y and z axes, respectively, and A is the cross-sectional area. J is the torsional stiffness factor; for circular cross sections this is equal to the polar moment of inertia (Iy + Iz), while for non-circular sections J is less than the polar moment of inertia.

In program KRASH, the following incremental deflection sums and differences are defined

$$\begin{Bmatrix} d_1 \\ d_2 \\ d_3 \\ d_4 \\ d_5 \\ d_6 \end{Bmatrix}_{ij} \triangleq \begin{Bmatrix} dx \\ dy \\ dz \\ d\phi \\ d\theta \\ d\psi \end{Bmatrix}_j - \begin{Bmatrix} dx \\ dy \\ dz \\ d\phi \\ d\theta \\ d\psi \end{Bmatrix}_i \qquad (1\text{-}31a)$$

$$\begin{Bmatrix} d_7 \\ d_8 \\ d_9 \end{Bmatrix}_{ij} \triangleq \begin{Bmatrix} d\phi \\ d\theta \\ d\psi \end{Bmatrix}_j + \begin{Bmatrix} d\phi \\ d\theta \\ d\psi \end{Bmatrix}_i \qquad (1\text{-}31b)$$

Utilizing these definitions, the incremental force and moment equations become

$$
\begin{aligned}
dFx_j &= k_x\, d_1 \\
dFy_j &= k_y\, d_2 + k_{y\psi} d_9 \\
dFz_j &= k_z\, d_3 + k_{z\theta}\, d_8 \\
dM\phi_j &= k_\phi\, d_4 \\
dM\theta_j &= k_{z\theta}\, d_3 + \frac{k_\theta}{4}\, d_5 + \frac{3}{4} k_\theta\, d_8 \\
dM\psi_j &= k_{y\psi}\, d_2 + \frac{k_\psi}{4}\, d_6 + \frac{3}{4} k_\psi\, d_9
\end{aligned}
\tag{1-32a}
$$

While the corresponding quantities at the i end of the beam are

$$
\begin{aligned}
dFx_i &= -dFx_j \\
dFy_i &= -dFy_j \\
dFz_i &= -dFz_j \\
dM\phi_i &= -dM\phi_j \\
dM\theta_i &= -dM\theta_j + \ell dFz_j \\
dM\psi_i &= -dM\psi_j - \ell dFy_j
\end{aligned}
\tag{1-32b}
$$

Figure 1-4 illustrates these incremental forces and moments at both ends of beam ij; positive values are shown in the figure.

In Equation (1-31), the d_7 term is used to update the torsional orientation of the beam axis system. Equation (1-16c) indicates that the beam Euler angle ϕ_{ij} is continuously updated by $d\phi_{ij}$. This is taken as the average incremental rotation of the i and j ends of the beam, and is given by

$$d\phi_{ij} = d_7/2 \tag{1-33}$$

where d_7 is given by Equation (1-31) as $(d\phi_j + d\phi_i)$

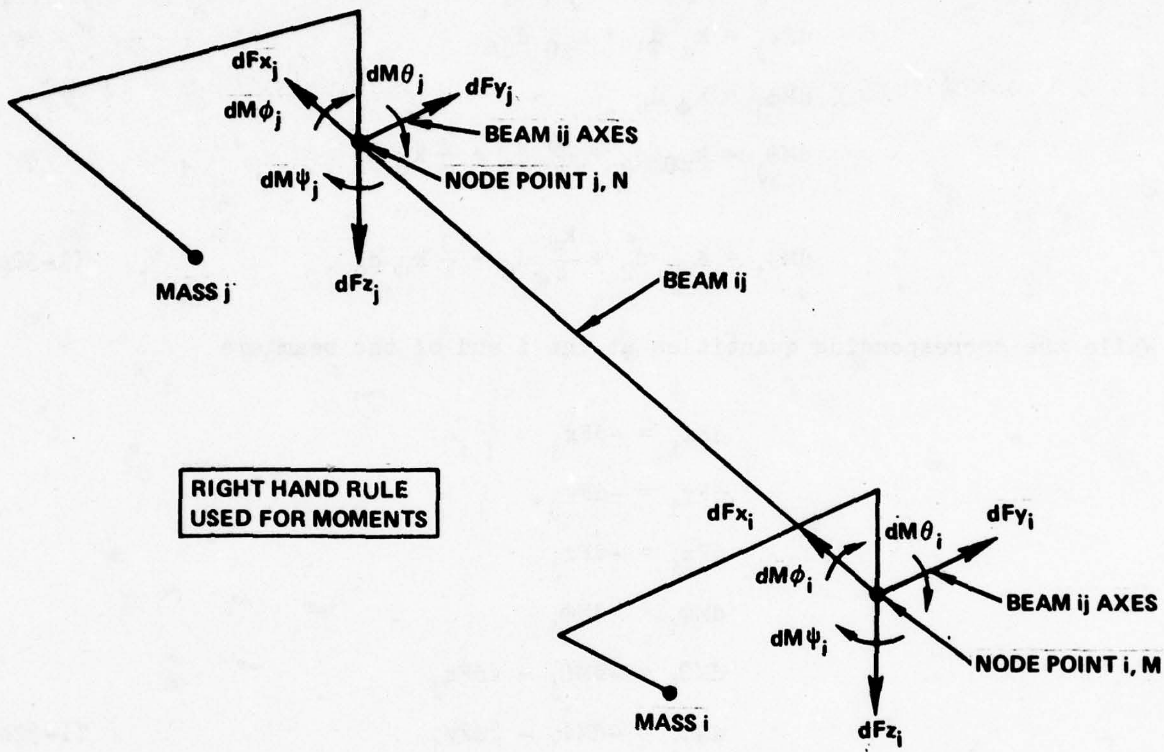


Figure 1-4. Beam Horizontal Strain Forces and Moments

1.3.5.3.3 Pinned End Conditions

Equations (1-32) developed in the preceding section are applicable only for the condition wherein the beam is built in or fixed at both ends. If the beam is pinned at both ends, then both the force and moment at i and j are zero in the plane perpendicular to the pin axis. If the beam is pinned at one end and fixed at the other end, then the equations derived in the preceding section are not applicable.

In order to illustrate the derivation of the force-deflection relationship for a single pinned-end condition, the coupled z - θ bending equations will be considered. Isolating these terms from Equation (1-23), we have

$$\begin{Bmatrix} dFz_i \\ dM\theta_i \\ dFz_j \\ dM\theta_j \end{Bmatrix} = EI_y \begin{bmatrix} 12/\ell^3 & -6/\ell^2 & -12/\ell^3 & -6/\ell^2 \\ & 4/\ell & 6/\ell^2 & 2/\ell \\ & \text{(symmetric)} & 12/\ell^3 & 6/\ell^2 \\ & & & 4/\ell \end{bmatrix} \begin{Bmatrix} dz_i \\ d\theta_i \\ dz_j \\ d\theta_j \end{Bmatrix} \qquad (1\text{-}34)$$

If there is a pinned connection at j, then $dM\theta_j$ is zero, and the above equation can be rewritten as

$$\begin{Bmatrix} dF_1 \\ \hline 0 \end{Bmatrix} = EI_y \left[\begin{array}{c|c} k_{11} & k_{12} \\ \hline k_{21} & k_{22} \end{array}\right] \begin{Bmatrix} dv_1 \\ \hline dv_2 \end{Bmatrix} \qquad (1\text{-}35)$$

$$K_{11}\, dv_1 + K_{12}\, dv_2 = dF_1/EI_y$$

$$K_{21}\, dv_1 + K_{22}\, dv_2 = 0$$

Solving the second equation for dv_2 and inserting into the first equation yields

$$\left[K_{11} - K_{12}\, K_{22}^{-1}\, K_{21}\right] dv_1 = dF_1/EI_y \qquad (1\text{-}36)$$

Rearranging, we have

$$dF_1 = EI_y \, [\bar{K}] \, dv_1 \tag{1-37}$$

where

$$dF_1 \triangleq \begin{Bmatrix} dFz_i \\ dM\theta_i \\ dFz_j \end{Bmatrix} \qquad dv_1 \triangleq \begin{Bmatrix} dz_i \\ d\theta_i \\ dz_j \end{Bmatrix} \tag{1-38a}$$

$$[\bar{K}] \triangleq \left[K_{11}\right] - \left[K_{12}\right] \left[K_{22}\right]^{-1} \left[K_{21}\right] \tag{1-38b}$$

$$\left[K_{11}\right] = \begin{bmatrix} 12/\ell^3 & -6/\ell^2 & -12/\ell^3 \\ -6/\ell^2 & 4/\ell & 6/\ell^2 \\ -12/\ell^3 & 6/\ell^2 & 12/\ell^3 \end{bmatrix} \text{ (3 x 3 matrix)} \tag{1-39a}$$

$$\left[K_{12}\right] = \begin{Bmatrix} -6/\ell^2 \\ 2/\ell \\ 6/\ell^2 \end{Bmatrix} \text{ (3 x 1 column matrix)} \tag{1-39b}$$

$$\left[K_{21}\right] = [-6/\ell^2 \;\; 2/\ell \;\; 6/\ell^2] \text{ (1 x 3 row matrix)} \tag{1-39c}$$

$$\left[K_{22}\right] = 4/\ell \text{ (1 x 1 scalar)} \tag{1-39d}$$

Incorporating (1-39) into (1-38), (1-37) becomes

$$\begin{Bmatrix} dFz_i \\ dM\theta_i \\ dFz_j \end{Bmatrix} = 3EI_y \begin{bmatrix} 1/\ell^3 & -1/\ell^2 & -1/\ell^3 \\ -1/\ell^2 & 1/\ell & 1/\ell^2 \\ -1/\ell^3 & 1/\ell^2 & 1/\ell^3 \end{bmatrix} \begin{Bmatrix} dz_i \\ d\theta_i \\ dz_j \end{Bmatrix} \tag{1-40}$$

Utilizing the stiffness terms defined by Equation (1-29c) this reduces to

$$\begin{Bmatrix} dFz_i \\ dM\theta_i \\ dFz_j \end{Bmatrix} = \begin{bmatrix} k_z/4 & -k_{z\theta}/2 & -k_z/4 \\ -k_{z\theta}/2 & \frac{3}{4}k_\theta & k_{z\theta}/2 \\ -k_z/4 & k_{z\theta}/2 & k_z/4 \end{bmatrix} \begin{Bmatrix} dz_i \\ d\theta_i \\ dz_j \end{Bmatrix}$$

Multiplying this out and using the definitions of (1-31), we obtain

$$\left.\begin{aligned} dFz_j &= \frac{k_z}{4} d_3 + \frac{k_{z\theta}}{2} d\theta_i \\ dM\theta_j &= 0 \\ dFz_i &= -dFz_j \qquad \text{(Pinned at j)} \\ dM\theta_i &= \frac{k_{z\theta}}{2} d_3 + \frac{3}{4} k_\theta \, d\theta_i \end{aligned}\right. \qquad (1\text{-}41a)$$

Similar derivations yield the following equations for the situation where the beam is pinned at i and fixed at j.

$$\left.\begin{aligned} dFz_j &= \frac{k_z}{4} d_3 + \frac{k_{z\theta}}{2} d\theta_j \\ dM\theta_j &= \frac{k_{z\theta}}{2} d_3 + \frac{3k_\theta}{4} d\theta_j \qquad \text{(Pinned at i)} \\ dFz_i &= -dFz_j \\ dM\theta_i &= 0 \end{aligned}\right. \qquad (1\text{-}41b)$$

Equations (1-41) are also applicable for the coupled $y - \psi$ bending if subscripts are changed appropriately. The resulting equations are shown for reference:

$$\left.\begin{aligned} dFy_j &= \frac{k_y}{4} d_2 + \frac{k_{y\psi}}{2} d\psi_i \\ dM\psi_j &= 0 \\ dFy_i &= -dFy_j \\ dM\psi_i &= \frac{k_{y\psi}}{2} d_2 + \frac{3}{4} k_\psi d\psi_i \end{aligned}\right\} \text{(Pinned at j)} \qquad \text{(1-42a)}$$

$$\left.\begin{aligned} dFy_j &= \frac{k_y}{4} d_2 + \frac{k_{y\psi}}{2} d\psi_j \\ dM\psi_j &= \frac{k_{y\psi}}{2} d_2 + \frac{3}{4} k_\psi d\psi_j \\ dFy_i &= -dFy_j \\ dM\psi_i &= 0 \end{aligned}\right\} \text{(Pinned at i)} \qquad \text{(1-42b)}$$

In program KRASH, only the equations for the forces and moments at j are calculated directly from (1-41) and (1-42). The forces and moments at i are calculated using the static balance Equations (1-32b); it can be shown that the results are the same as the i end equations from (1-41) and (1-42).

This concludes the discussion of the linear incremental strain forces and moments; the following section describes the treatment of the nonlinear behavior of the beam elements.

1.3.5.3.4 Nonlinear Strain Forces and Moments

Figure 1-5 illustrates a typical nonlinear load-deflection characteristic curve, in this case the axial load at point j, Fx'_j, versus the axial deflection of j with respect to i, vx. Program KRASH utilizes a piecewise linear representation of the load-deflection curve. At each increment in time, a linear incremental force dFx_j is calculated according to the equations of the previous sections. This incremental force is then multiplied by a stiffness reduction factor, KR_x, to obtain the *nonlinear incremental force* dF'_x. These increments are then summed over time to form the total force Fx'_i. Figure 1-5 illustrates a typical incremental deflection dvx, the corresponding linear incremental force dFx_j and the final nonlinear incremental force dFx'_j.

The stiffness reduction factor KR_x is an input tabular function of deflection vx. Figure 1-6 shows the KR_x vs vx curve that corresponds to the load-deflection curve in Figure 1-5. Clearly KR_x is just the first derivative of the load-deflection curve with respect to deflection. Any KR curve can be input by the program user to model any general nonlinear behavior. Certain standard curves are available to represent the more common types of nonlinearities. These are discussed in detail in the User's Guide (Volume II).

Separate KR tables are input for each of the 6 directions for which it is desired to model nonlinear behavior, for beam ij. In practice, perhaps only 20% or less of all the beams will be modeled nonlinearly. (If no KR table is input, KR = 1 and the beam is linear for the entire run.) In general then, we have

$$\left\{dF_j'\right\} = \begin{bmatrix} KR_x & & & & & \\ & KR_y & & & & \\ & & KR_z & & & \\ & & & KR_\phi & & \\ & & & & KR_\theta & \\ & & & & & KR_\psi \end{bmatrix} \left\{dF_j\right\} \qquad (1\text{-}43)$$

where the diagonal [KR] matrix is composed of six stiffness reduction factors, each of which is an input tabular function of the corresponding total beam deflection. The KR's are functions of the time sums of the first six incremental deflections in Equation (1-31); these are all the (j - i) relative deflections:

$$\begin{Bmatrix} vx \\ vy \\ vz \\ v\phi \\ v\theta \\ v\psi \end{Bmatrix} = \sum_{o}^{t} \begin{Bmatrix} d_1 \\ d_2 \\ d_3 \\ d_4 \\ d_5 \\ d_6 \end{Bmatrix} = \sum_{o}^{t} \begin{Bmatrix} dx_j - dx_i \\ dy_j - dy_i \\ dz_j - dz_i \\ d\phi_j - d\phi_i \\ d\theta_j - d\theta_i \\ d\psi_j - d\psi_i \end{Bmatrix} \qquad (1\text{-}44)$$

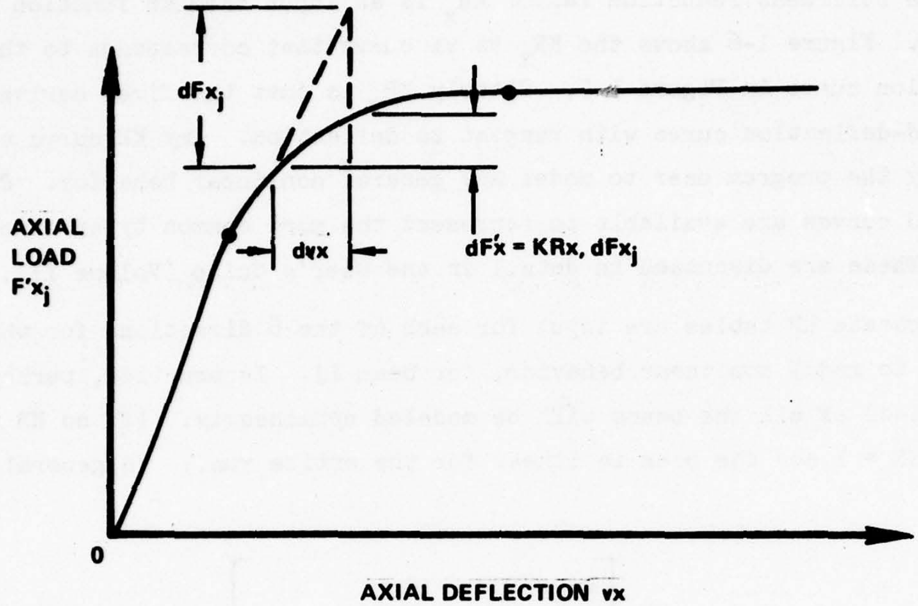


Figure 1-5. Nonlinear Load Deflection Curve

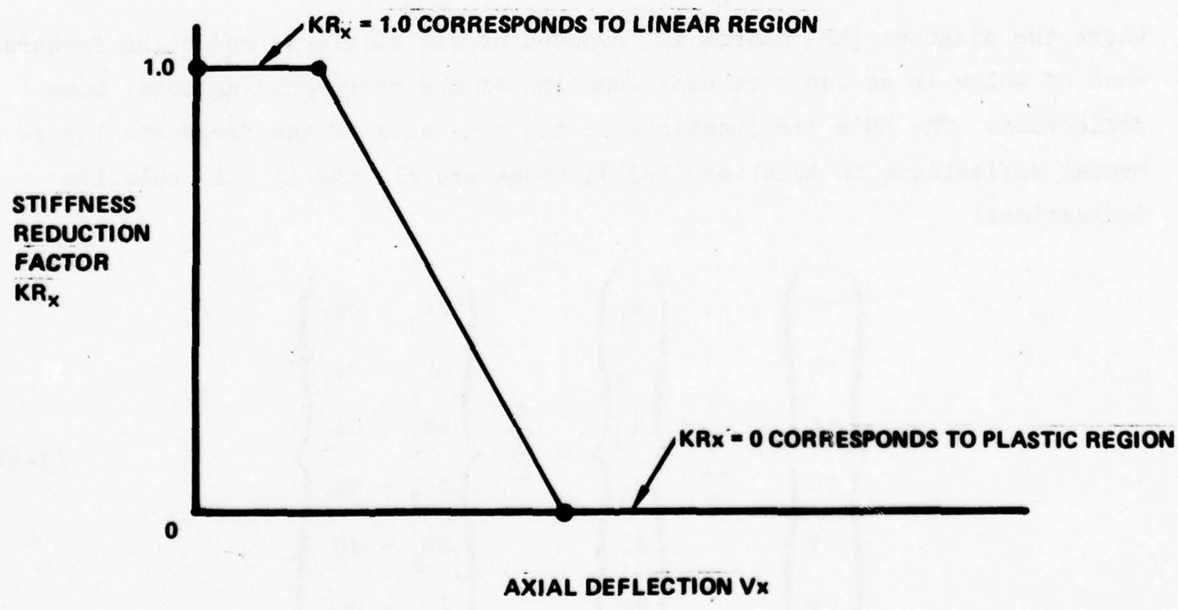


Figure 1-6. Stiffness Reduction Factor Curve

$$KR_x = f(vx)$$
$$KR_y = f(vy)$$
$$KR_z = f(vz)$$
$$KR_\phi = f(v\phi) \tag{1-45}$$
$$KR_\theta = f(v\theta)$$
$$KR_\psi = f(v\psi)$$

The total beam forces are calculated as the time sums of the incremental forces from Equation (1-43):

$$\left\{F_j'\right\} = \sum_o^t \left\{dF_j'\right\} \tag{1-46a}$$

$$\left\{F_i'\right\} = \sum_o^t \left\{dF_i'\right\} \tag{1-46b}$$

These total strain forces are in beam axes and act at the ends of the beam as shown in Figure 1-4 for the incremental strain forces.

For the uncoupled degrees of freedom (x and ϕ), the force depends only on one relative deflection and the corresponding KR curve. This situation was illustrated previously for the x (axial) direction. For the coupled degrees of freedom, Equation (1-32a) implies that a given force depends on 2 or 3 deflection terms and the one KR curve corresponding to the force. For example, if we combine Equations (1-32a) and (1-43) for the coupled z, θ degrees of freedom, we have

$$dFz_j' = KR_z(d_3)\left[k_z\, d_3 + k_{z\theta}\, d_8\right]$$
$$dM\theta_j' = KR_\theta(d_5)\left[k_{z\theta}\, d_3 + \frac{k_\theta}{4} d_5 + \frac{3}{4} k_\theta\, d_8\right] \tag{1-47}$$

where the parentheses after the KR terms indicate their functional relationships, not a multiplication.

If the calculations are actually performed in the above manner, the independent behavior of dz and dθ (and therefore d_3 and d_5) will result in different values for KR_z and KR_θ at any point in time. Since the proportionality of dFz and dMθ that always exists in the linear system is lost, this computational scheme has a strong tendency to yield negative strain energy, which a real physical system, even nonlinear, can never do. Furthermore, one would intuitively expect that any failure mechanism in the actual structure which causes yielding or nonlinear behavior in the z direction would also cause similar nonlinear behavior in the coupled θ direction. This reasoning could be extended to include all six independent deflections, so that when any one direction displays nonlinear behavior, this same nonlinearity holds for all 6 directions. However, it is felt that the argument for similar behavior is most persuasive for the coupled degrees of freedom, and that the axial and torsional modes should be treated independently.

In light of the foregoing, the program is coded in the following manner. For the coupled degrees of freedom, the direction which goes nonlinear first determines the nonlinear behavior for both coupled directions. In the above example, this means that if KR_z departs from 1 (linear) before KR_θ does, then KR_z is used for both dFz' and dMθ' for the remainder of the run. If KR_θ goes nonlinear first, then it is used in calculating both dFz' and dMθ' for the rest of the run. This analytical model preserves the proportionality that exists between dFz and dMθ in the linear system, since the linear incremental forces are always multiplied by the same KR factor. The coupled degrees of freedom y and ψ are treated in the same manner. In each case, both deflection and rotation KR curves are input, even though only one will be used, because it is not known in advance which direction will predominate. Axial and torsional deflections are uncoupled and each has its own KR curve, applicable for the entire analysis.

In addition to the nonlinear load capability just described, the program also allows for unloading and subsequent reloading to proceed along an elastic line. This is illustrated in Figure 1-7. The ordinate Fx_j' is the total (over time) axial load for beam ij, from Equation (1-46). Similarly, vx is the corresponding total (over time) axial deflection from Equation (1-44).

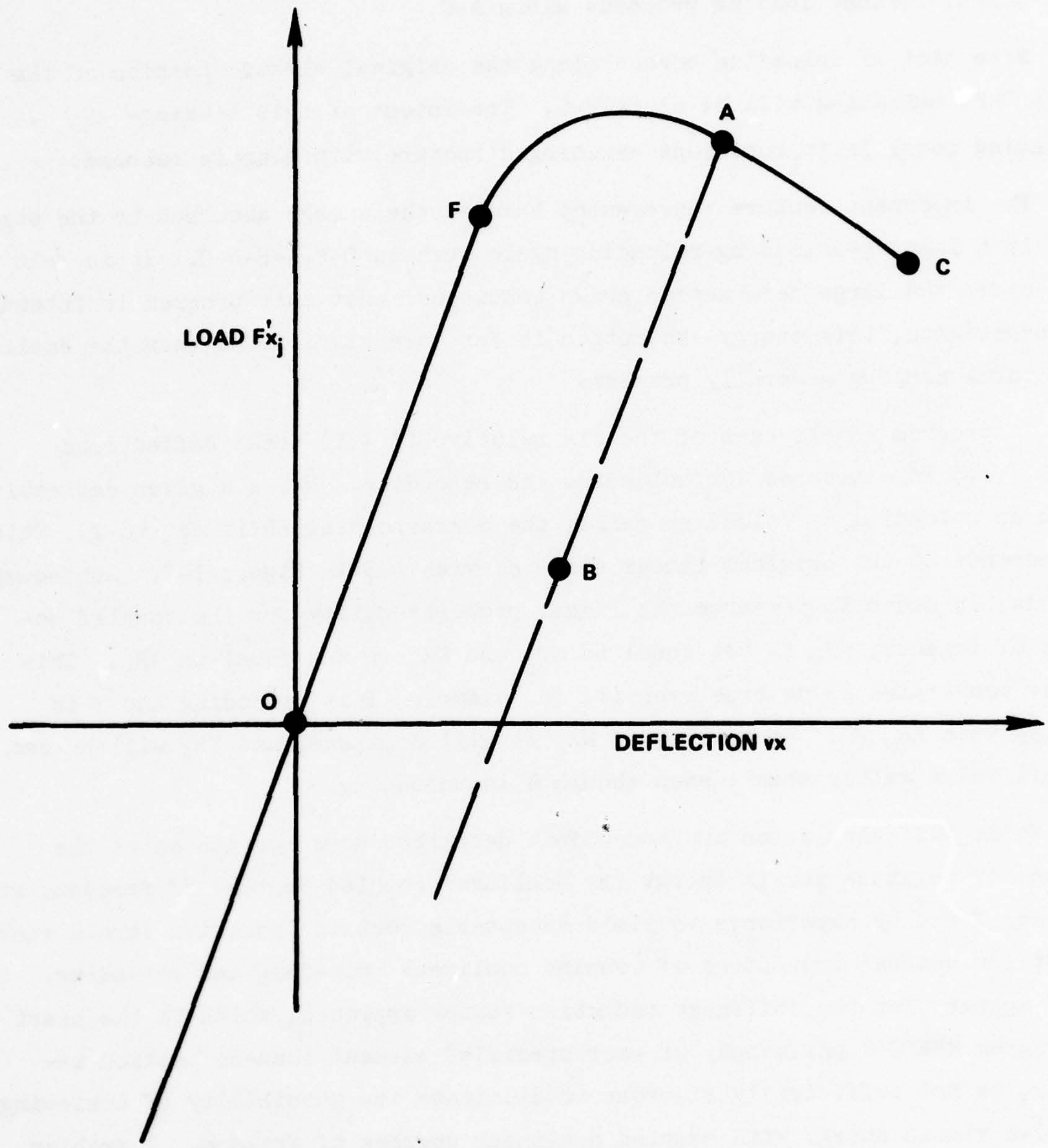


Figure 1-7. Loading - Unloading Model

Loading proceeds along the solid line 0-F-A. Unloading then proceeds along dashed line A-B, parallel to the original linear loading line 0-F. Subsequent reloading then proceeds along B-A, until point A is reached. At this point, further loading proceeds along A-C.

Note that if unloading occurs along the original elastic portion of the curve 0-F, unloading will be along F-0. The intent of this loading-unloading model is to represent crushing structure with elastic rebound.

The important feature represented here is the energy absorbed by the structure in a loading-unloading-reloading cycle such as 0-F-A-B-A-C. It is felt that under the large deformation crash conditions that this program is intended to investigate, this energy absorption is far more significant than the small structural damping generally present.

In program KRASH, each of the six relative (j - i) total deflections ($v\dot{x}$ ... $v\psi$) is monitored for unloading and reloading. While a given deflection is in an unloading or reloading phase, the corresponding KR is set to 1. This corresponds to the original linear slope as with A-B in Figure 1-7. Subsequent to this, in order to preserve the linear proportionality for the coupled degrees of freedom, KR_θ is set equal to KR_z and KR_ψ is set equal to KR_y. This latter constraint holds true even if, for example, θ is unloading and z is loading with $KR_z \neq 1$. In this case, $KR_z \neq 1$ will dominate, and KR_θ will be set to this value rather than 1 even though θ is unloading.

While the calculation procedure just described does not guarantee the absence of negative strain energy for nonlinear coupled degrees of freedom, it has been found by experience to yield acceptable results (positive strain energy) except for unusual conditions of coupled nonlinear unloading and reloading. It would appear that the stiffness reduction factor approach, which is the heart of program KRASH's philosophy of user specified element load-deflection behavior, is not sufficiently rigorous to eliminate the possibility of achieving negative strain energy with coupled nonlinear degrees of freedom. A problem formulation based on stress-strain relationships and the compatibility of elemental strains and beam deflections would be required. Such a formulation would involve considerably more computational detail than is used in program KRASH, and would substantially slow down the program execution. In light of

the high degree of success with practical applications of program KRASH, it is felt that the current formulation is quite satisfactory from a practical analysis standpoint, if not from a rigorous analytical viewpoint.

Finally, it should be noted that only the coupled nonlinear degrees of freedom pose potential problems. All linear motion is rigorously correct and never yields negative strain energy, and the uncoupled degrees of freedom (x and ϕ) are well-behaved even with nonlinearities. Since the strain energy of each beam is part of the output, the user will be aware if any beams with negative strain energy exist in the model.

Program KRASH also provides for complete element failure, termed rupture, if any of the six beam relative deflections $\{v\}$ or six total beam forces $\{F_j'\}$ exceed specified input values. If any deflection or force exceeds allowable values, that ij beam element ruptures and all its forces and moments are set to zero for the remainder of the run.

1.3.5.3.5 Unsymmetrical Beam Elements

The beam elements described previously behave symmetrically, meaning that the linear and nonlinear load-deflection characteristics are the same for both positive and negative deflections. Positive deflections yield positive loads, and equal negative deflections result in equal negative loads. For certain modeling situations, it may be desirable to have available beam elements with different characteristics for positive and negative deflections. While providing this capability for the coupled bending degrees of freedom would be unduly complicated for the potential benefits, the uncoupled axial degree of freedom can be treated in a straightforward manner. The axial degree of freedom is also the one wherein unsymmetrical behavior is most common.

Situations calling for unsymmetrical axial load-deflection behavior include "string" type elements such as seat belts or wire braces and diagonal elements representative of shear panel behavior. These applications call for a tension-only element, with zero compression capability. Contact between surfaces not originally touching can be modeled with compression-only elements. An example of this would be an element connecting a landing gear wheel to the

fuselage or wing structure. Until large deformations occur, these surfaces are not in contact. However, after the failure of a landing gear, a wheel may subsequently contact the fuselage or wing. A compression-only element with a deadband could be used to model this type of contact.

Figure 1-8 illustrates the general form of unsymmetrical axial load-deflection characteristic that is allowed in program KRASH. A tension-only element with backlash is illustrated. The load is zero for axial extensions less than DB_{ij}, an input deadband constant for beam ij. Beyond this point, the normal linear/nonlinear beam characteristics are employed, with the following exception. The total (over time) load is never allowed to be negative (for a tension-only element). Therefore, during unloading the path A-B-C is followed, holding Fx_j' at zero when a negative value (compresson load) would normally occur. Reloading follows C-B-A. The general load-deflection curve for a compression-only element would look like Figure 1-8 except the non-zero loading would be in the lower left quadrant. The input data specifies whether the beam is a tension-only or compression-only element, if it has been identified as an unsymmetrical element.

In order to model a general unsymmetrical element with different non-zero tension and compression properties, two separate beams connecting the same end points are used in the model. One beam is defined as a tension-only element, and the other as a compression only element.

1.3.5.3.6 Damping Forces and Moments

In addition to the nonlinear strain forces and moments derived in the preceding sections, program KRASH also provides for the calculation of damping forces and moments for the internal beams. In order to retain the balance between force and moment for the coupled degrees of freedom inherent in the strain formulation, the damping forces are calculated using the linear stiffness matrix. Naturally, however, these forces are in phase with the velocities rather than the displacements. The resulting model is of the following form.

$$\{FD\} = \frac{2\zeta}{\omega}[K]\{vel\} \tag{1-48}$$

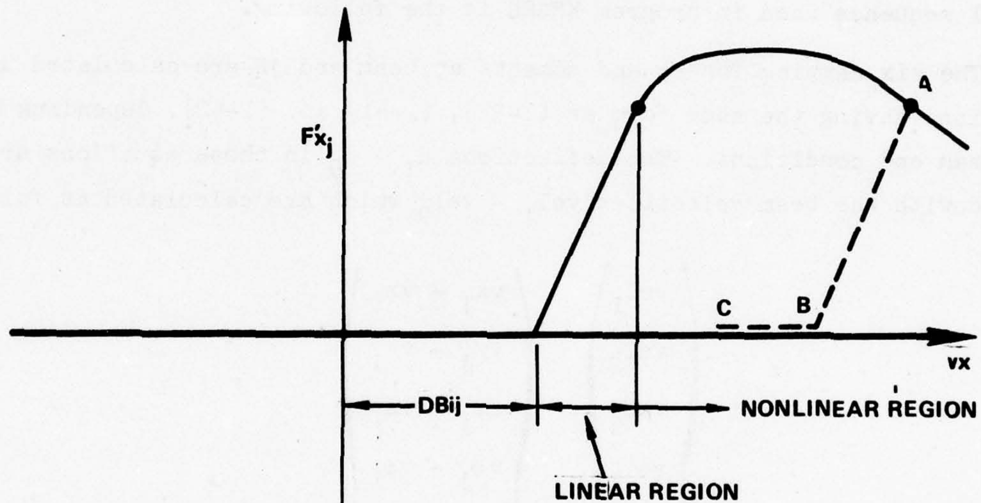


Figure 1-8. Unsymmetrical Axial Load-Deflection Curve

The linear stiffness matrix is multiplied by the beam end point velocity vector. For pure sinusoidal motion, this formulation is the same as conventional structural type damping, in which the damping forces are proportional in magnitude to the strain forces but in phase with the velocity. In such a system, ω would be the response frequency and ζ the damping ratio.

For the actual non-sinusoidal motion of program KRASH, the damping force model could be considered as a pseudo-structural damping model. In this case, the ω in the above equation is taken as the natural frequency of the isolated system consisting of beam ij and the end masses m_i and m_j. The actual computational sequence used in program KRASH is the following.

The six damping forces and moments at beam end jN are calculated using equations having the same form as (1-32), (1-41) and (1-42), depending upon the beam end conditions. The deflections d_1 - d_9 in those equations are replaced with the beam velocities vel_1 - vel_9 which are calculated as follows

$$\begin{Bmatrix} vel_1 \\ vel_2 \\ vel_3 \\ vel_4 \\ vel_5 \\ vel_6 \\ vel_7 \\ vel_8 \\ vel_9 \end{Bmatrix} = \begin{Bmatrix} vx_j - vx_i \\ vy_j - vy_i \\ vz_j - vz_i \\ v\phi_j - v\phi_i \\ v\theta_j - v\theta_i \\ v\psi_j - v\psi_i \\ v\phi_j + v\phi_i \\ v\theta_j + v\theta_i \\ v\psi_j + v\psi_i \end{Bmatrix} \qquad (1\text{-}49)$$

where the terms on the right are given by Equations (1-20) and (1-22). Similarly, the terms $d\theta_i$, $d\theta_j$, $d\psi_i$, $d\psi_j$ appearing in (1-41) and (1-42) for fixed-pinned end conditions, are replaced by $v\theta_i$, $v\theta_j$, $v\psi_i$ and $v\psi_j$, respectively. The resulting damping forces at jN, in beam axes, are denoted by $\{FD_j\}$, and are shown here for reference.

$$\left.\begin{aligned}
FDx_j &= k_x\ vel_1 \\
FDy_j &= k_y\ vel_2 + k_{y\psi}\ vel_9 \\
FDz_j &= k_z\ vel_3 + k_{z\theta}\ vel_8 \\
MD\phi_j &= k_\phi\ vel_4 \\
MD\theta_j &= k_{z\theta}\ vel_3 + \frac{k_\theta}{4}\ vel_5 + \frac{3k_\theta}{4}\ vel_8 \\
MD\psi_j &= k_{y\psi}\ vel_2 + \frac{k_\psi}{4}\ vel_6 + \frac{3k_\psi}{4}\ vel_9
\end{aligned}\right\}\ \text{(Fixed-Fixed)} \quad (1\text{-}50)$$

$$\left.\begin{aligned}
FDy_j &= \frac{k_y}{4}\ vel_2 + \frac{k_{y\psi}}{2}\ v\psi_i \\
MD\psi_j &= 0
\end{aligned}\right\}\ \text{(Pinned at j about y axis)} \quad (1\text{-}51a)$$

$$\left.\begin{aligned}
FDz_j &= \frac{k_z}{4}\ vel_3 + \frac{k_{z\theta}}{2}\ v\theta_i \\
MD\theta_j &= 0
\end{aligned}\right\}\ \text{(Pinned at j about z axis)} \quad (1\text{-}51b)$$

$$\left.\begin{aligned}
FDy_j &= \frac{k_y}{4}\ vel_2 + \frac{k_{y\psi}}{2}\ v\psi_j \\
MD\psi_j &= \frac{k_{y\psi}}{2}\ vel_2 + \frac{3k_\psi}{4}\ v\psi_j
\end{aligned}\right\}\ \text{(Pinned at i about y axis)} \quad (1\text{-}52a)$$

$$\left.\begin{aligned}
FDz_j &= \frac{k_z}{4}\ vel_3 + \frac{k_{z\theta}}{2}\ v\theta_j \\
MD\theta_j &= \frac{k_{z\theta}}{2}\ vel_3 + \frac{3k_\theta}{4}\ v\theta_j
\end{aligned}\right\}\ \text{(Pinned at i about z axis)} \quad (1\text{-}52b)$$

The result of Equations (1-50), (1-51), and (1-52) is a 6 element force/moment vector $\left\{FD_j\right\}$. Each of these elements is next multiplied by a damping coefficient to obtain the actual damping force/moment at the j end of the beam.

$$\{FD_j'\} = \begin{bmatrix} C_1 & & & & & \\ & C_2 & & & & \\ & & C_3 & & & \\ & & & C_4 & & \\ & & & & C_5 & \\ & & & & & C_6 \end{bmatrix} \{FD_j\} \tag{1-53}$$

The damping coefficients are calculated as

$$C_K = 2\zeta_{ij}/\omega_k \qquad k = 1, \ldots, 6 \tag{1-54}$$

where ζ_{ij} is the damping ratio for beam ij which is an input constant. The natural frequency ω_k for each of the 6 beam directions is calculated as

$$\omega_k = \sqrt{\frac{\bar{K}_k(m_i + m_j)}{m_i\ m_j}} \qquad k = 1, 2, 3 \tag{1-55a}$$

$$\omega_{k+3} = \sqrt{\frac{K_{k+3}\ (I_{i_k} + I_{j_k})}{I_{i_k}\ I_{j_k}}} \qquad k = 1, 2, 3 \tag{1-55b}$$

Equations (1-55) are the natural frequency equations for a beam with concentrated inertias at each end. The 6 $\bar{K}_k$'s used in (1-55) are just the diagonal elements of the stiffness matrix for beam ij.

$$\begin{Bmatrix} \bar{K}_1 \\ \bar{K}_2 \\ \bar{K}_3 \\ \bar{K}_4 \\ \bar{K}_5 \\ \bar{K}_6 \end{Bmatrix} = \begin{Bmatrix} k_x \\ k_y \\ k_z \\ k_\phi \\ k_\theta \\ k_{\hat{\psi}} \end{Bmatrix}_{ij} \tag{1-56}$$

These terms were defined in Equations (1-28), (1-29c) and (1-30c). The inertia terms I_{i_k} and I_{j_k}, k = 1, 2, 3, are the inertias of mass i and j, resolved into beam ij axes. These are given by the diagonal elements of the following matrices.

$$[I_i]_{ij\ \text{axes}} = [AIJTAI]\,[I_i]_{\substack{\text{mass}\\ \text{axes}}}\,[AIJTAI]^T \qquad (1\text{-}57a)$$

$$[I_j]_{ij\ \text{axes}} = [AIJTAJ]\,[I_j]_{\substack{\text{mass}\\ \text{axes}}}\,[AIJTAJ]^T \qquad (1\text{-}57b)$$

All quantities in equations (1-54) through (1-57) are constants which do not vary with time. Therefore, these items are calculated just once prior to the main time loop in program KRASH. Equation (1-53) for the damping force vector is, of course, within the time loop. In Equation (1-57), the time zero values of [AIJTAI] and [AIJTAJ] are used, since these are functions of $[A_{ij}]$, $[A_i]$ and $[A_j]$. Although all three of these component matrices are time-varying, their time zero values correspond to an undistorted vehicle and yield the proper transformation from mass to beam axes for the undeformed structure.

1.3.5.3.7 Total Internal Beam Forces and Moments

Equations (1-46a) and (1-53) yield the strain and damping forces and moments at jN. These are denoted $\{F_j'\}$ and $\{FD_j'\}$, respectively. The corresponding quantities at the iM end of the beam are calculated using the static balance Equations (1-32b). These are denoted $\{F_i'\}$ and $\{FD_i'\}$. These four independent sets of forces/moments are used to calculate the internal beam strain and damping energies. These calculations are described in Section 1.3.16. After the energy calculations, we no longer need the strain and damping forces separately. Therefore, the two are now added together to form the total internal beam load.

$$\{FS_i\} = \{F_i'\} + \{FD_i'\} \tag{1-58a}$$

$$\{FS_j\} = \{F_j'\} + \{FD_j'\} \tag{1-58b}$$

These forces are in beam axes with positive directions indicated in Figure 1-4, which shows the forces acting on beam ij. To get the forces acting on masses m_i and m_j, we must reverse the signs and resolve the vectors from beam axes to mass axes.

$$\{FS_i'\} = - [AIJTAI]^T \{FS_i\} \tag{1-59a}$$

$$\{FS_j'\} = - [AIJTAJ]^T \{FS_j\} \tag{1-59b}$$

where the transformation matrices are defined by Equation (1-18). These forces act at beam ends iM and jN in mass axes.

The moments acting on the masses must now be corrected to account for the offset of the node points from the masses. Figure 1-2 shows the offset, where the vector $\{rx, ry, rz\}$ contains the offset components in mass fixed axes. These are not time-varying quantities, since each node point is rigidly attached to a defined mass point. The moments at the mass points are given by

$$\begin{Bmatrix} FS_{i_4}' \\ FS_{i_5}' \\ FS_{i_6}' \end{Bmatrix} = \begin{Bmatrix} FS_{i_4}' \\ FS_{i_5}' \\ FS_{i_6}' \end{Bmatrix}_{(1\text{-}59a)} + \left[TR_{iM}\right] \begin{Bmatrix} FS_{i_1}' \\ FS_{i_2}' \\ FS_{i_3}' \end{Bmatrix} \tag{1-60a}$$

$$\begin{Bmatrix} FS_{j_4}' \\ FS_{j_5}' \\ FS_{j_6}' \end{Bmatrix} = \begin{Bmatrix} FS_{j_4}' \\ FS_{j_5}' \\ FS_{j_6}' \end{Bmatrix}_{(1-59b)} + \left[TR_{jN}\right] \begin{Bmatrix} FS_{j_1}' \\ FS_{j_2}' \\ FS_{j_3}' \end{Bmatrix} \qquad (1\text{-}60b)$$

where the first vectors on the right hand side are the three moments from Equation (1-59). These moments act at the node points rather than at the masses. The second vector contains the three forces from (1-59) which act at the node points. The transformation matrices are of the following skew-symmetric form:

$$\left[TR_{iM}\right] = \begin{bmatrix} 0 & -rz & ry \\ rz & 0 & -rx \\ -ry & rx & 0 \end{bmatrix}_{iM} \qquad (1\text{-}61a)$$

$$\left[TR_{jN}\right] = \begin{bmatrix} 0 & -rz & ry \\ rz & 0 & -rx \\ -ry & rx & 0 \end{bmatrix}_{jN} \qquad (1\text{-}61b)$$

These are not time-varying matrices.

Equations (1-59) and (1-60) give the current internal beam forces and moments acting on masses m_i and m_j, due to beam ij, in mass-fixed axes. To obtain the total internal forces and moments acting on each mass, the contributions from each internal beam connecting to a given mass must be accounted for. In program KRASH, this is done within the beam ij loop where $\{FS_i'\}$ and $\{FS_j'\}$ are calculated. These are merely added to the total internal forces and moments for mass i and mass j.

$$
\begin{Bmatrix} X_I \\ Y_I \\ Z_I \\ L_I \\ M_I \\ N_I \end{Bmatrix}_i = \begin{Bmatrix} X_I \\ Y_I \\ Z_I \\ L_I \\ M_I \\ N_I \end{Bmatrix}_i + \left\{ FS_i' \right\} \tag{1-62a}
$$

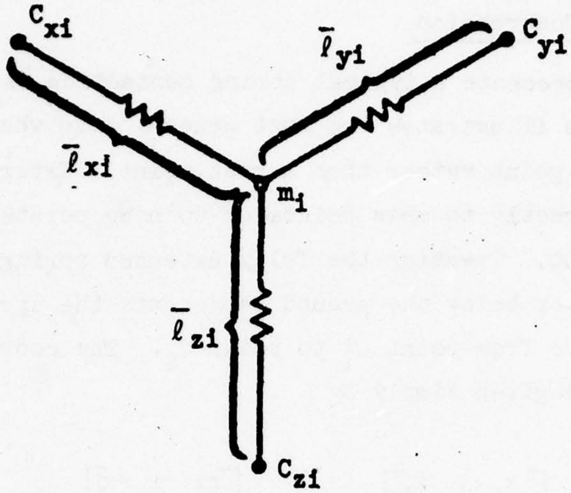
$$
\begin{Bmatrix} X_I \\ Y_I \\ Z_I \\ L_I \\ M_I \\ N_I \end{Bmatrix}_j = \begin{Bmatrix} X_I \\ Y_I \\ Z_I \\ L_I \\ M_I \\ N_I \end{Bmatrix}_j + \left\{ FS_j' \right\} \tag{1-62b}
$$

Equations (1-62) should be interpreted as follows. At each time cut, prior to entering the beam loop which calculates the beam forces for all the ij beams in the model, $(X_{I_i} \ldots, N_{I_i})$ are all set to zero for all masses i. Equation (1-62) is then employed for each beam in turn, where $\{FS_i'\}$ and $\{FS_j'\}$ are added to the total internal beam forces acting on the proper masses i and j, respectively. Once all the beams have been calculated in the beam loop, $(X_{I_i} \ldots, N_{I_i})$ will contain the contributions from all beams connecting to mass m_i, for all the masses in the model.

1.3.5.4 External Forces and Moments

The crash forces result from the compression of external springs radiating from selected mass or node points, when these springs contact either the ground

plane (z = 0) or the slope (z_{sl} = 0). The following sketch shows the three spring radiating outward from mass i:



The free (uncompressed) lengths of the three springs are denoted $\overline{\ell}_{xi}$, $\overline{\ell}_{yi}$, and $\overline{\ell}_{zi}$. These springs lie along the body axes for the ith mass. $\overline{\ell}_{xi}$, $\overline{\ell}_{yi}$, and $\overline{\ell}_{zi}$ are input either positive or negative, depending upon whether the spring radiates outward along the positive or negative body axis. Those shown above are all positive springs. C_{xi}, C_{yi}, and C_{zi} are the end points of the fully extended springs. Only data for those springs desired in the analysis need be input; if no spring is input, its crash forces are set to zero. Typically, only those masses at the extremities of the vehicle likely to contact the ground would have crash springs. The intent of these springs is to represent crushable external structure such as found on the lower fuselage and nose sections.

The first step in the calculation is to determine which of the C_{xi}, C_{yi}, and C_{zi} spring end points are below the ground or slope. Only these springs are further analyzed to determine their crash forces. For these springs, the spring compression along the spring axis is determined, as well as the compression velocity and the ground contact point velocity. Then the spring force along the spring axis is calculated, from which the vertical load in ground axes at the ground contact point is obtained. From this vertical load and an input friction coefficient, the ground drag load is computed. The direction of this load is opposite the ground contact point velocity vector.

Finally, the three forces at the ground contact point are rotated into ith mass body axes, and the resulting forces and moments at mass i are calculated.

1.3.5.4.1 Spring Compression

Figure 1-9 represents a typical spring contacting the ground at an oblique angle. This figure illustrates the most general case where the spring is attached to a node point rather than a mass point. External springs can be attached either directly to mass points or to node points. Point C_i' is the ground contact point. Treating the fully extended spring as a vector, that portion of the vector below the ground represents the spring compression. This is the distance from point C_i' to point C_i. The coordinates of point C_i, in ground axes, are given simply by

$$\begin{bmatrix} xc_{xi} & xc_{yi} & xc_{zi} \\ yc_{xi} & yc_{yi} & yc_{zi} \\ zc_{xi} & zc_{yi} & zc_{zi} \end{bmatrix} = \begin{bmatrix} x_i & x_i & x_i \\ y_i & y_i & y_i \\ z_i & z_i & z_i \end{bmatrix} + [A_i] \begin{bmatrix} rx & rx & rx \\ ry & ry & ry \\ rz & rz & rz \end{bmatrix}_{iM} + [A_i] \begin{bmatrix} \bar{\ell}_{xi} & & \\ & \bar{\ell}_{yi} & \\ & & \bar{\ell}_{zi} \end{bmatrix} \quad (1\text{-}63)$$

The above equation gives the coordinates of all three C_i for mass i; these points are denoted C_{xi}, C_{yi}, and C_{zi}. Figure 1-9 shows only one of the three springs, so the nomenclature in Figure 1-9 is not subscripted to indicate whether an x, y or z spring is shown. The third term in the above equation is equal to dx_{ci}, dy_{ci}, and dz_{ci} in Figure 1-9:

$$\begin{bmatrix} dxc_{xi} & dxc_{yi} & dxc_{zi} \\ dyc_{xi} & dyc_{yi} & dyc_{zi} \\ dzc_{xi} & dzc_{yi} & dzc_{zi} \end{bmatrix} = [A_i] \begin{bmatrix} \bar{\ell}_{xi} & & \\ & \bar{\ell}_{yi} & \\ & & \bar{\ell}_{zi} \end{bmatrix} \quad (1\text{-}64)$$

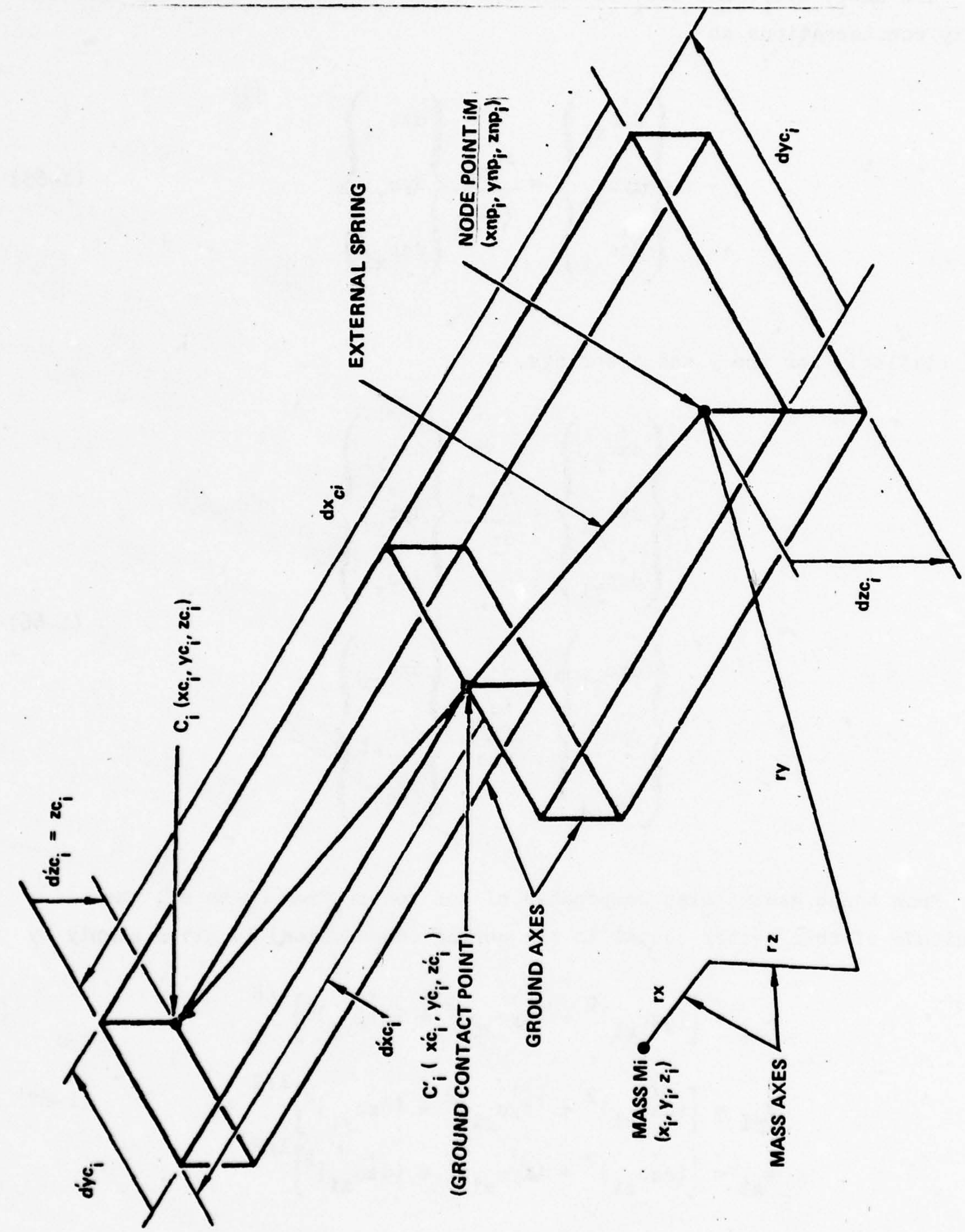


Figure 1-9. External Spring Compression Geometry

The dxc_i', dyc_i', and dzc_i' in Figure 1-9 can be determined from proportionality considerations as

$$\begin{Bmatrix} dxc'_{xi} \\ dyc'_{xi} \\ dzc'_{xi} \end{Bmatrix} = \frac{zc_{xi}}{dzc_{xi}} \begin{Bmatrix} dxc_{xi} \\ dyc_{xi} \\ dzc_{xi} \end{Bmatrix} \tag{1-65}$$

and similarly for the y and z springs,

$$\begin{Bmatrix} dxc'_{yi} \\ dyc'_{yi} \\ dzc'_{yi} \end{Bmatrix} = \frac{zc_{yi}}{dzc_{yi}} \begin{Bmatrix} dxc_{yi} \\ dyc_{yi} \\ dzc_{yi} \end{Bmatrix}$$

$$\begin{Bmatrix} dxc'_{zi} \\ dyc'_{zi} \\ dzc'_{zi} \end{Bmatrix} = \frac{zc_{zi}}{dzc_{zi}} \begin{Bmatrix} dxc_{zi} \\ dyc_{zi} \\ dzc_{zi} \end{Bmatrix} \tag{1-66}$$

From these ground axes components of the vector from C_i' to C_i, the magnitude of this vector (equal to the spring compression) is given simply by

$$\begin{aligned} s_{xi} &= \left[(dxc'_{xi})^2 + (dyc'_{xi})^2 + (dzc'_{xi})^2\right]^{1/2} \\ s_{yi} &= \left[(dxc'_{yi})^2 + (dyc'_{yi})^2 + (dzc'_{yi})^2\right]^{1/2} \\ s_{zi} &= \left[(dxc'_{zi})^2 + (dyc'_{zi})^2 + (dzc'_{zi})^2\right]^{1/2} \end{aligned} \tag{1-67}$$

In order to simplify the notation, the following vectors and matrices are defined ($i = 1, 2, \ldots, N$ indicates the mass; $j = 1,2,3$ indicates the direction; $k = 1,2,3$ indicates which spring):

$$\bar{l}_{ik} \triangleq \begin{Bmatrix} \bar{l}_{xi} \\ \bar{l}_{yi} \\ \bar{l}_{zi} \end{Bmatrix} \qquad va_{ij} \triangleq \begin{Bmatrix} x_i \\ y_i \\ z_i \end{Bmatrix} \qquad s_{ik} \triangleq \begin{Bmatrix} s_{xi} \\ s_{yi} \\ s_{zi} \end{Bmatrix}$$

$$dvc_{ijk} \triangleq \begin{array}{cc} j & \begin{bmatrix} dxc_{xi} & dxc_{yi} & dxc_{zi} \\ dyc_{xi} & dyc_{yi} & dyc_{zi} \\ dzc_{xi} & dzc_{yi} & dzc_{zi} \end{bmatrix} \\ & k \end{array}$$

$$vc_{ijk} \triangleq \begin{array}{cc} j & \begin{bmatrix} xc_{xi} & xc_{yi} & xc_{zi} \\ yc_{xi} & yc_{yi} & yc_{zi} \\ zc_{xi} & zc_{yi} & zc_{zi} \end{bmatrix} \\ & k \end{array} \tag{1-68}$$

$$dvc'_{ijk} \triangleq \begin{array}{cc} j & \begin{bmatrix} dxc'_{xi} & dxc'_{yi} & dxc'_{zi} \\ dyc'_{xi} & dyc'_{yi} & dyc'_{zi} \\ dzc'_{xi} & dzc'_{yi} & dzc'_{zi} \end{bmatrix} \\ & k \end{array}$$

Using this nomenclature, equations (1-63) through 1-67) become simply

$$vc_{ijk} = va_{ij} + dvr_{ij} + dvc_{ijk} \tag{1-69}$$

$$\left\{dvr_i\right\} = [A_i] \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM} \tag{1-70}$$

$$dvc_{ijk} = A_{ijk}\overline{\ell}_{ik} \tag{1-71}$$

$$d\acute{v}c_{ijk} = \frac{vc_{i3k}}{dvc_{i3k}}\, dvc_{ijk} \tag{1-72}$$

$$s_{ik} = \left[\sum_{j=1}^{3}\left(d\acute{v}c_{ijk}\right)^2\right]^{1/2} \tag{1-73}$$

The spring compression velocity, $\dot{s}_{ik}$, is also required. This is given by differentiating Equation (1-73) as

$$\dot{s}_{ik} = \frac{1}{2s_{ik}}\sum_{j=1}^{3} 2\, d\acute{v}c_{ijk}\left(\dot{d}\acute{v}c_{ijk}\right) \tag{1-74}$$

where the last term is obtained from (1-72) as

$$\dot{d}\acute{v}c_{ijk} = \frac{vc_{i3k}}{dvc_{i3k}}\dot{d}vc_{ijk} + dvc_{ijk}\frac{dvc_{i3k}\dot{v}c_{i3k} - vc_{i3k}\dot{d}vc_{i3k}}{(dvc_{i3k})^2} \tag{1-75}$$

The time derivatives in (1-75) are given by

$$\dot{d}vc_{ijk} = \dot{A}_{ijk}\overline{\ell}_{ik} \qquad j = 1,2,3 \tag{1-76}$$

$$v\dot{c}_{ijk} = \dot{z}_i + d\dot{v}r_{ij} + \dot{d}vc_{ijk} \qquad j = 1,2,3 \tag{1-77}$$

$$\left\{d\dot{v}r_i\right\} = [\dot{A}_i]\begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM} \tag{1-78}$$

The above equations are appropriate if the spring intersects the horizontal ground plane. If the spring intersects the sloping ground plane, the following equations are utilized:

$$vcs\ell_{ijk} = \sum_{\ell=1}^{3} ABETA_{j\ell}\ vc_{i\ell k} \tag{1-79}$$

$$dvcs\ell_{ijk} = \sum_{\ell=1}^{3} ABETA_{j\ell}\ dvc_{i\ell k} \tag{1-80}$$

$$dvcs\ell'_{ijk} = \frac{vcs\ell_{i3k}}{dvcs\ell_{i3k}}\ dvcs\ell_{ijk} \tag{1-81}$$

$$s_{ik} = \left[\sum_{j=1}^{3}\left(dvcs\ell'_{ijk}\right)^2\right]^{1/2} \tag{1-82}$$

$$\dot{s}_{ik} = \frac{1}{2s_{ik}} \sum_{j=1}^{3} 2dvcs\ell'_{ijk}\left(d\dot{v}cs\ell'_{ijk}\right) \tag{1-83}$$

$$d\dot{v}cs\ell'_{ijk} = \frac{vcs\ell_{i3k}}{dvcs\ell_{i3k}}\ d\dot{v}cs\ell_{ijk} + dvcs\ell_{ijk}\ \frac{dvcs\ell_{i3k}\ vcs\ell_{i3k} - v\dot{c}s\ell_{i3k}\ d\dot{v}cs\ell_{i3k}}{\left(dvcs\ell_{i3k}\right)^2} \tag{1-84}$$

$$d\dot{v}cs\ell_{ijk} = \sum_{\ell=1}^{3} ABETA_{j\ell}\ dvc_{i\ell k} \tag{1-85}$$

$$vc\dot{s}\ell_{i3k} = (\sin \beta)\, v\dot{c}_{i1k} + (\cos \beta)\, v\dot{c}_{i3k} \qquad (1\text{-}86)$$

1.3.5.4.2 Ground Contact Point Velocity

The next computation required is to determine the spring contact point velocity in the ground plane (either the horizontal ground plane or the slope plane, whichever the spring is contacting). This is necessary to determine the line of action of the ground plane drag load, which is opposite to the contact point velocity vector. The velocity of point C' with respect to ground is given in vector notation as

$$ {}^{0}\underset{V}{\rightarrow}{}^{C'} = {}^{m_i}\underset{V}{\rightarrow}{}^{C'} + {}^{0}\underset{V}{\rightarrow}{}^{C'} \qquad (1\text{-}87)$$

where

${}^{0}\underset{V}{\longrightarrow}{}^{C'}$ = velocity of C' with respect to ground

${}^{m_i}\underset{V}{\longrightarrow}{}^{C'}$ = velocity of C' with respect to m_i

${}^{0}\underset{V}{\longrightarrow}{}^{C'}$ = velocity of point fixed in m_i, instantaneously coinciding with point C', with respect to ground

This latter term is given by

$$ {}^{0}\underset{V}{\rightarrow}{}^{C'} = {}^{0}\underset{V}{\longrightarrow}{}^{m_i} + {}^{0}\underset{\omega_i}{\longrightarrow}{}^{m_i} \times \vec{R}_{iKM} \qquad (1\text{-}88)$$

where

$\overset{0\rightarrow m_i}{V}$ = velocity of m_i with respect to ground

$\overset{0\rightarrow m_i}{\omega}$ = rotational velocity of m_i with respect to ground

$\vec{R}_{ikM}$ = vector from m_i to spring/ground contact point C'

Figure 1-10 illustrates the geometry involved. The vector $\vec{R}_{ikM}$ is given by

$$\begin{Bmatrix} Rx \\ Ry \\ Rz \end{Bmatrix}_{ikM} = \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{ikM} + \underset{k=1}{\begin{Bmatrix} \ell_{i1} \\ 0 \\ 0 \end{Bmatrix}} \text{ or } \underset{k=2}{\begin{Bmatrix} 0 \\ \ell_{i2} \\ 0 \end{Bmatrix}} \text{ or } \underset{k=3}{\begin{Bmatrix} 0 \\ 0 \\ \ell_{i3} \end{Bmatrix}} \tag{1-89}$$

The components of (1-87) and (1-88) are given by

$$m_i \vec{V} C' = - \dot{s}_{ik} \, \bar{n}_{ik} \qquad \text{(body axes)} \tag{1-90}$$

$$\overset{0\rightarrow}{V} m_i = \dot{x}_i \, \bar{n}_x + \dot{y}_i \, \bar{n}_y + \dot{z}_i \, \bar{n}_z \text{ (ground axes)} \tag{1-91}$$

$$0 \overset{\rightarrow}{\omega} m_i \times \vec{R}_{ikM} = \begin{bmatrix} 0 & -r_i & q_i \\ r_i & 0 & -p_i \\ -q_i & p_i & 0 \end{bmatrix} \begin{Bmatrix} Rx \\ Ry \\ Rz \end{Bmatrix}_{ikM} \qquad \text{(body axes)} \tag{1-92}$$

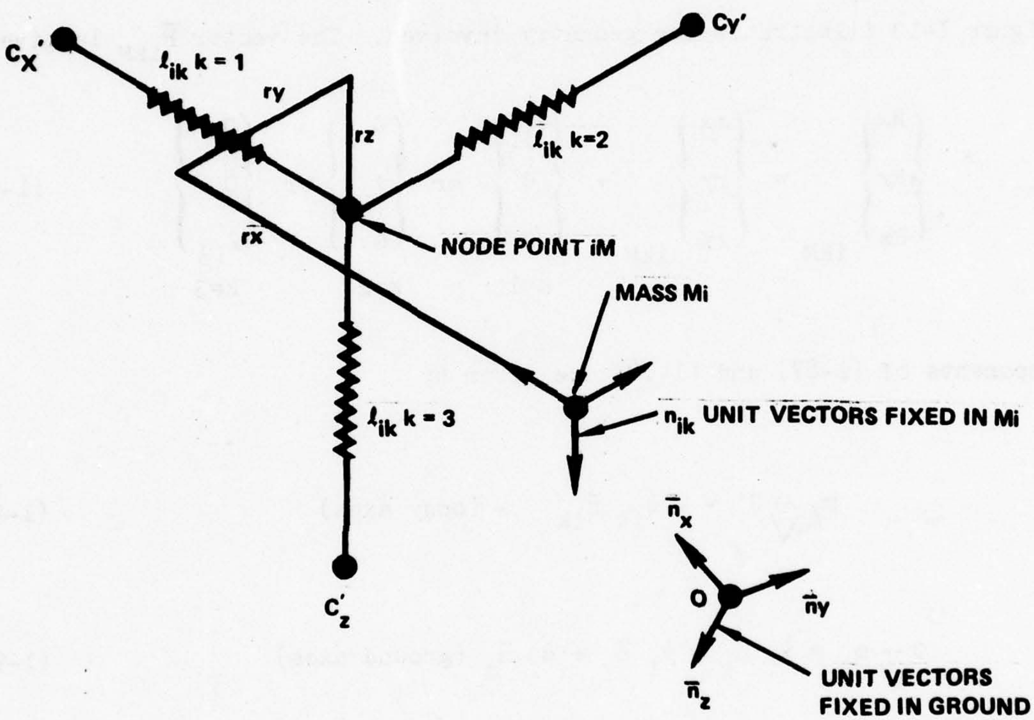


Figure 1-10. External Spring Geometry

Combining the above equations, the ground contact point velocity is given by

$$\overset{0 \longrightarrow C'}{V} \triangleq \{\dot{vcp}\}_{ikM} = \begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix} + [A_i] \begin{Bmatrix} -\dot{s}_{i1} \\ 0 \\ 0 \end{Bmatrix} \text{ or } \begin{Bmatrix} 0 \\ -\dot{s}_{i2} \\ 0 \end{Bmatrix} \text{ or } \begin{Bmatrix} 0 \\ 0 \\ -\dot{s}_{i3} \end{Bmatrix}$$

$$+ [A_i] \begin{bmatrix} 0 & -r_i & q_i \\ r_i & 0 & -p_i \\ -q_i & p_i & 0 \end{bmatrix} \begin{Bmatrix} rx \\ ry \\ rz \end{Bmatrix}_{iM}$$

$$+ [A_i] \begin{bmatrix} 0 & -r_i & q_i \\ r_i & 0 & -p_i \\ -q_i & p_i & 0 \end{bmatrix} \begin{Bmatrix} \ell_{i1} \\ 0 \\ 0 \end{Bmatrix} \text{ or } \begin{Bmatrix} 0 \\ \ell_{i2} \\ 0 \end{Bmatrix} \text{ or } \begin{Bmatrix} 0 \\ 0 \\ \ell_{i3} \end{Bmatrix} \tag{1-93}$$

where the three options apply to k = 1, 2 or 3 in the order shown. In other words, Equation (1-93) represents three equations, applicable to either an x, y or z (k = 1, 2 or 3) direction external spring. The time varying spring length 1_{ik} is Equation (1-93) is calculated as

$$\ell_{ikM} = \text{SIGN}\left(\overline{\ell}_{ikM}\right)\left[\left|\overline{\ell}_{ikM}\right| - s_{ikM}\right] \tag{1-94}$$

This form is used so that ℓ_{ikM} has the same sign as the input $\overline{\ell}_{ikM}$, which as mentioned earlier can be negative to allow springs in the negative direction of the body axes. These spring lengths are shown in Figure 1-10; the points C' in this figure are the ground contact points. If an external spring is directly connected to a mass m_i instead of a node point, then (rx, ry, rz) are all zero.

If the spring is contacting the slope rather than the horizontal ground, the above velocities are transformed into slope axes as follows:

$$\dot{vcps\ell}_{ijk} = \sum_{\ell=1}^{3} ABETA_{j\ell}\ \dot{vcp}_{i\ell k} \tag{1-95}$$

1.3.5.4.3 <u>External Spring Axial Force</u>

This section discusses the calculation of the external spring force along the spring axis. The axial force in the spring, denoted $FSPO_{ikM}$, is input as a tabular function of the spring compression s_{ikM}. As with the internal forces, unloading along an elastic line is included. However, unlike the internal forces, an extension load is not allowed; positive $FSPO_{ikM}$ is a compressive load acting at the ground contact point along the axis of spring ikM.

Figure 1-11 illustrates the shape of the input external spring load-deflection curve. SI, SA, SB, SF, FSPOI, FSPOF and Ke are all input constants.

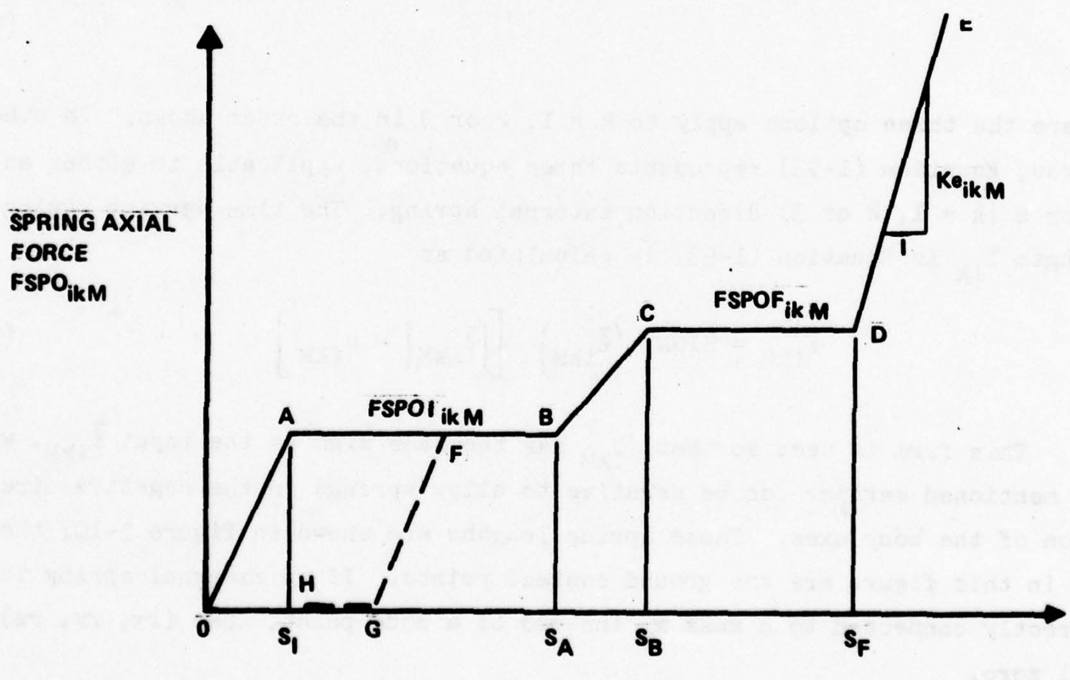


Figure 1-11. External Spring Load-Stroke Curve

Loading proceeds along 0-A-B-C-D-E. At any spring compression s_{ikM} less than SA, unloading occurs along a line having the same slope as 0-A. At any spring compression between SA and SF, unloading occurs along a line parallel to B-C. (If an extension of this unloading line would cross above 0-A-B, resulting in more energy released during unloading than input during loading, then the unloading curve is parallel to 0-A rather than B-C.) Once SF is reached, all subsequent loading and unloading follows line D-E and its extension in both directions. In all cases, unloading does not extend beyond FSPO = 0. For example, if unloading begins at F, it proceeds along F-G (parallel to 0-A), and then holds at FSPO = 0 from G to H. Subsequent reloading takes place along H-G-F-B-C-D-E. There is no rupture of external spring elements.

A first-order approximation of the effect of ground flexibility is included in the following manner. A ground flexibility constant fg_{ikM} is input for each external spring. The deflection coordinates in Figure 1-11 are modified to include this flexibility.

$$\begin{aligned} SIFL_{ikM} &= SI_{ikM} + FSPOI_{ikM} * fg_{ikM} \\ SAFL_{ikM} &= SA_{ikM} + FSPOI_{ikM} * fg_{ikM} \\ SBFL_{ikM} &= SB_{ikM} + FSPOF_{ikM} * fg_{ikM} \\ SFFL_{ikM} &= SF_{ikM} + FSPOF_{ikM} * fg_{ikM} \end{aligned} \tag{1-96}$$

This has the effect of softening the input load-deflection curve representing the airplane structure to indlude the flexibility of the ground in series with the structure. The bottoming spring constant is modified as follows:

$$KEFL_{ikM} = \frac{1}{\frac{1}{ke_{ikM}} + fg_{ikM}} \tag{1-97}$$

The ground deflection is calculated for each spring at each time cut as

$$\text{DELG}_{ikM} = \text{FSPO}_{ikM} * fg_{ikM} \tag{1-98}$$

Furthermore, the ground is never allowed to rebound; the ground deflection always increases or stays constant. This is accomplished by setting DELG_{ikM} at each time step to the maximum of the current value and the previous maximum. The ground deflection must also be accounted for in the calculation of the deflected spring length from Equation (1-94).

$$\ell_{ikM} = \text{SIGN}\left(\overline{\ell}_{ikM}\right)\left[\left|\overline{\ell}_{ikM}\right| - s_{ikM} + \text{DELG}_{ikM}\right] \tag{1-99}$$

In effect, the spring compression s_{ikM} is reduced by the amount that is directly attributable to ground deflection, since the spring/ground interface is actually lower than would be calculated for a rigid ground.

The flow diagram for the calculation of the spring-force FSPO_{ik} is shown in Figure 1-12. The calculations are performed within nested i and k loops. Immediately prior to the calculations shown in Figure 1-12, there is a test to see if an external spring exists for the ik pair being considered. If a spring exists, it is checked to see if it is in contact with either the horizontal ground or the slope. If both these tests are satisfied, the algorithm shown in Figure 1-12 is entered, otherwise this block of coding is skipped. In Figure 1-12, SK is the spring compression s_{ik}.

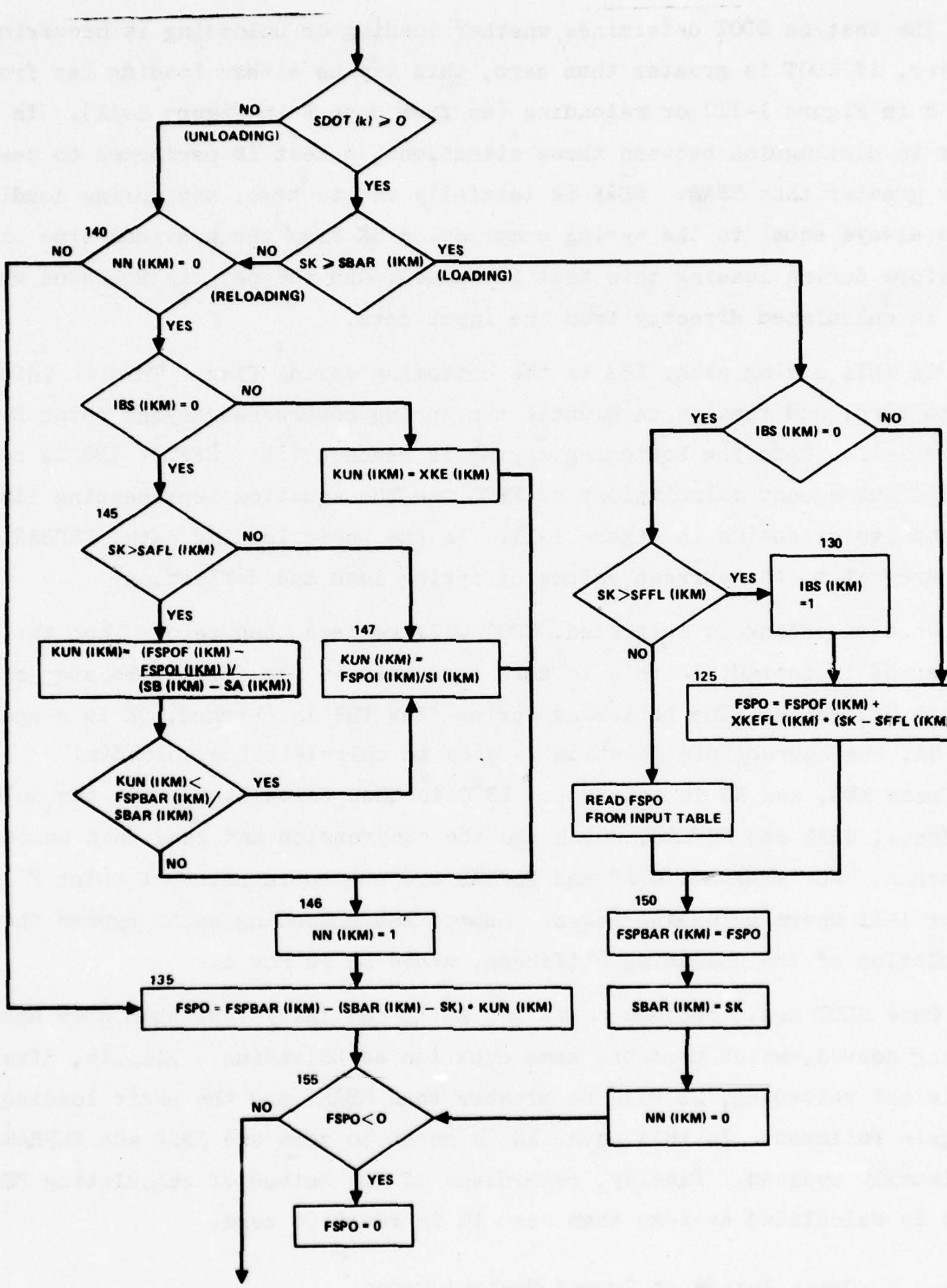


Figure 1-12. External Load Calculation

The test on SDOT determines whether loading or unloading is occurring. However, if SDOT is greater than zero, this may be either loading (as from A to B in Figure 1-11) or reloading (as from G to F in Figure 1-11). In order to distinguish between these situations, a test is performed to see if SK is greater than SBAR. SBAR is initially set to zero, and during loading it is always equal to the spring compression SK from the previous time step. Therefore during loading this test is passed, and the path is followed wherein FSPO is calculated directly from the input data.

In this coding path, IBS is the bottoming spring flag. This is initially set to zero, and remains zero until the spring compresses beyond point D in Figure 1-11. Once the bottoming spring is reached (SK > SFFL), IBS is set to 1 and all subsequent calculations of FSPO use the equation representing line D-E and its extension in Figure 1-11. In the basic loading path, FSPBAR and SBAR are set to the current values of spring load and deflection.

Once unloading is initiated, SDOT will be less than zero. Then the counter NN is tested; if this is zero then this is the first time step of the current unloading. The bottoming spring flag IBS is checked, SK is compared with SA, the appropriate equation is used to calculate the unloading stiffness KUN, and NN is set to 1. FSPO is then calculated using the unloading stiffness, SBAR and FSPBAR, which are the compression and load when unloading began. For example, SBAR and FSPBAR are the coordinates of point F in Figure 1-11 where unloading began. Subsequent unloading paths bypass the calculation of the unloading stiffness, since NN is now 1.

Once SDOT again becomes positive, SK is initially less than SBAR and reloading occurs, which uses the same equation as unloading. Finally, after sufficient reloading, SK will be greater than SBAR, and the basic loading path is again followed. In this path, NN is reset to zero and SBAR and FSPBAR are continually updated. Finally, regardless of the method of calculating FSPO, if it is calculated as less than zero it is reset to zero.

1.3.5.4.4 Crash Forces at Ground Contact Point

The three components of the ground interaction force at the ground contact point are denoted by $XVOC_{ijk}$, where, as before, i refers to the ith

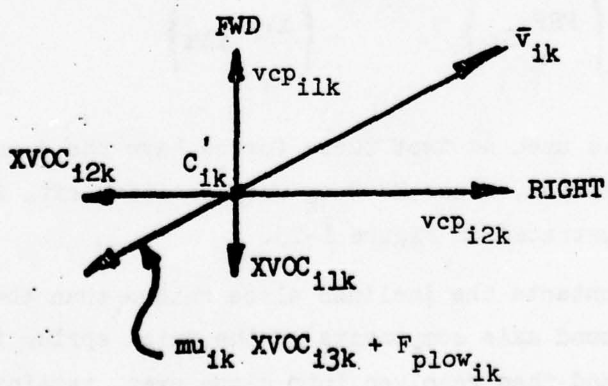
mass, j to the force direction, and k to the kth spring for mass i. First the component of the axial spring force perpendicular to the ground is computed. This is positive upward acting on the spring. This is given simply by resolving $FSPO_{ik}$ into ground axes and retaining only the vertical component.

$$XVOC_{i3k} = A_{i3k} FSPO_{ik} \, SIGN\left(\overline{\ell}_{ik}\right) \qquad k = 1,2,3 \qquad (1\text{-}100)$$

since $FSPO_{ik}$ acts along the kth body axis for mass i. The SIGN $(\overline{\ell}_{ik})$ term is necessary to retain the convention of $XVOC_{i3k}$ acting positive upward with negative springs. The ground plane components of the axial force $FSPO_{ik}$ are ignored, since these values are next computed on the assumption that they are functions of the ground-spring friction coefficient. The ground plane velocity vector, from Equation (1-93), has the magnitude

$$\overline{v}_{ik} = \left[(\dot{v}cp_{i1k})^2 + (\dot{v}cp_{i2k})^2\right]^{1/2} \qquad (1\text{-}101)$$

This is shown in the following sketch, a plan view looking downward at ground contact point C'_{ik}:



The magnitude of the resultant ground plane load is given by $\left(mu_{ik} XVOC_{i3k} + F_{plow_{ik}}\right)$, i.e., an input friction coefficient times the vertical load perpendicular to the ground plane, plus a constant plowing force. $F_{plow_{ik}}$ and mu_{ik} are input constants. $F_{plow_{ik}}$ is a constant plowing force that acts from t = 0 to t = PLOWT, an input constant, and then drops to 0 for the remainder of the run. mu_{ik} and $F_{plow_{ik}}$ together allow the program user to calculate a drag load that is either dependent on the vertical load or is a constant. The direction of the total ground plane load is opposite to the contact point velocity vector $\overline{v}_{ik}$, as shown in the above sketch. Therefore, the drag and side loads at point C'_{ik}, in ground axes, are given by

$$XVOC_{ijk} = \left[mu_{ik} XVOC_{i3k} + F_{plow_{ik}} \right] \frac{\dot{vcp}_{ijk}}{\overline{v}_{ik}} \qquad j = 1,2 \qquad (1\text{-}102)$$

These are illustrated in the above sketch. These forces are now resolved back into ith mass body axes; these resolved forces are denoted by FSP_{ijk}.

We have

$$\begin{Bmatrix} FSP_{i1k} \\ FSP_{i2k} \\ FSP_{i3k} \end{Bmatrix} = -[A_i]^T \begin{Bmatrix} XVOC_{i1k} \\ XVOC_{i2k} \\ XVOC_{i3k} \end{Bmatrix} \qquad k = 1,2,3 \qquad (1\text{-}103)$$

The minus sign is used so that these forces have the same sense as the basic body axis convention, since $XVOC_{ijk}$ were positive aft, left and upward. These forces are illustrated in Figure 1-13.

If the spring contacts the inclined slope rather than the horizontal ground, all three ground axis components of the axial spring force $FSPO_{ik}$ are obtained first, and then resolved into slope axes, retaining only the component normal to the slope. For this situation,

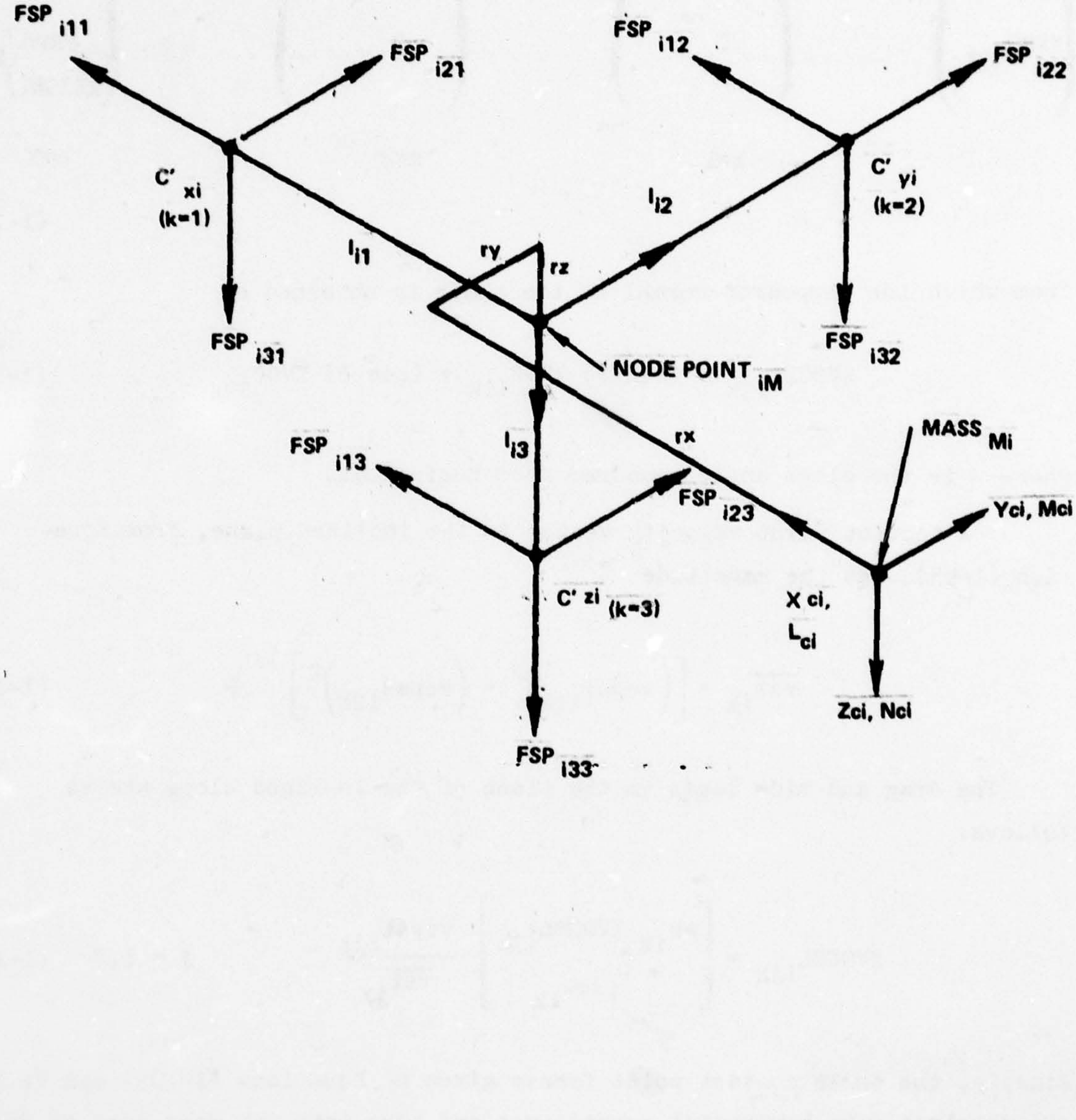


Figure 1-13. Crash Forces and Moments

$$\begin{Bmatrix} XVOC_{i1k} \\ XVOC_{i2k} \\ XVOC_{i3k} \end{Bmatrix} = [A_i] \begin{Bmatrix} FSPO_{ik} \\ x SIGN(\bar{\ell}_{ik}) \\ 0 \\ 0 \end{Bmatrix} \text{ or } [A_i] \begin{Bmatrix} 0 \\ FSPO_{ik} \\ x SIGN(\bar{\ell}_{ik}) \\ 0 \end{Bmatrix} \text{ or } [A_i] \begin{Bmatrix} 0 \\ 0 \\ FSPO_{ik} \\ x SIGN(\bar{\ell}_{ik}) \end{Bmatrix}$$

$$k=1 \qquad\qquad k=2 \qquad\qquad k=3$$

(1-104)

from which the component normal to the slope is obtained as

$$XVOCSL_{i3k} = (\sin \beta)\ XVOC_{i1k} + (\cos \beta)\ XVOC_{i3k} \tag{1-105}$$

where β is the slope angle measured from horizontal.

The contact point velocity vector in the inclined plane, from Equation (1-95), has the magnitude

$$\overline{vs\ell}_{ik} = \left[\left(vc\dot{p}s\ell_{i1k}\right)^2 + \left(vc\dot{p}s\ell_{i2k}\right)^2\right]^{1/2} \tag{1-106}$$

The drag and side loads in the plane of the inclined slope are as follows.

$$XVOCSL_{ijk} = \begin{bmatrix} mu_{ik}\ XVOCSL_{i3k} \\ + F_{plow_{ik}} \end{bmatrix} \frac{vc\dot{p}s\ell_{ijk}}{\overline{vs\ell}_{ik}} \qquad j = 1,2 \tag{1-107}$$

Finally, the three contact point forces given by Equations (1-105) and (1-107) are resolved into horizontal ground axes and then into ith mass axes to form the FSP_{ijk} illustrated in Figure 1-13.

$$\begin{Bmatrix} FSP_{i1k} \\ FSP_{i2k} \\ FSP_{i3k} \end{Bmatrix} = - [A_i]^T [ABETA] \begin{Bmatrix} XVOCSL_{i1k} \\ XVOCSL_{i2k} \\ XVOCSL_{i3k} \end{Bmatrix} \quad k = 1,2,3 \quad (1\text{-}108)$$

Now that the spring contact forces are in ith mass axes, there is no further distinction between forces resulting from contact with the horizontal ground (Equation (1-103)) and those resulting from contact with the slope (Equation (1-108)).

1.3.5.4.5 Crash Forces and Moments at Point m_i

Figure 1-13 shows the crash forces and moments acting at m_i, which are just the resultant of the FSP_{ijk} also shown in Figure 1-13; i.e., the FSP_{ijk} are just moved to point m_i and compensating moments at m_i added.

$$XC_{iM} = \sum_{k=1}^{3} FSP_{i1k}$$

$$YC_{iM} = \sum_{k=1}^{3} FSP_{i2k} \quad i = 1,2,\ldots,N \quad (1\text{-}109a)$$

$$ZC_{iM} = \sum_{k=1}^{3} FSP_{i3k}$$

$$\begin{aligned} LC_{iM} &= FSP_{i32}\,(ry + \ell_{i2}) - FSP_{i23}\,(\ell_{i3} + rz) \\ &\quad + ry\,(FSP_{i31} + FSP_{i33}) - rz\,(FSP_{i21} + FSP_{i22}) \\ MC_{iM} &= FSP_{i13}\,(rz + \ell_{i3}) - FSP_{i31}\,(rx + \ell_{i1}) \\ &\quad + rz\,(FSP_{i11} + FSP_{i12}) - rx\,(FSP_{i32} + FSP_{i33}) \qquad (1\text{-}109b) \\ NC_{iM} &= FSP_{i21}\,(rx + \ell_{i1}) - FSP_{i12}\,(ry + \ell_{i2}) \\ &\quad + rx\,(FSP_{i22} + FSP_{i23}) - ry\,(FSP_{i11} + FSP_{i13}) \end{aligned}$$

The ℓ_{ik} are from Equation (1-99); recall that they may be plus or minus to allow for springs in the negative direction of the mass body axes. Figure 1-13 shows all ℓ_{ik} positive.

Equations (1-109) yield only the contribution of springs attached to node point iM to the total external spring forces and moments acting on mass m_i. To achieve the desired total forces and moments on m_i, the contributions from all node points attached to m_i and having external springs must be summed.

$$\begin{Bmatrix} XC_i \\ YC_i \\ ZC_i \end{Bmatrix} = \sum_{M=1}^{NNP_i} \begin{Bmatrix} XC_{im} \\ YC_{im} \\ ZC_{im} \end{Bmatrix}$$

$$\begin{Bmatrix} LC_i \\ MC_i \\ NC_i \end{Bmatrix} = \sum_{M=1}^{NNP_i} \begin{Bmatrix} LC_{im} \\ MC_{im} \\ NC_{im} \end{Bmatrix} \tag{1-110}$$

where NNP_i is the number of node points attached to mass m_i and having external springs.

1.3.6 Total Forces and Moments

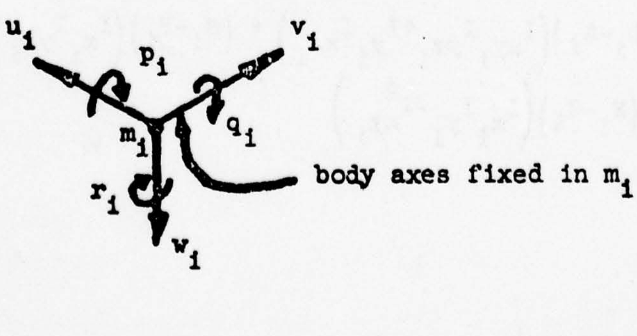
The total forces and moments at m_i, in ith body axes, are used to drive the six rigid-body degrees of freedom of lumped mass m_i. These total forces and moments are just the sum of the components, i.e., the gravity, aerodynamic, internal beam, and external spring forces and moments. The total loads are given by:

$$
\begin{aligned}
X_i &= X_{G_i} + X_{A_i} + X_{I_i} + X_{C_i} \\
Y_i &= Y_{G_i} + Y_{A_i} + Y_{I_i} + Y_{C_i} \\
Z_i &= Z_{G_i} + Z_{A_i} + Z_{I_i} + Z_{C_i} \\
L_i &= L_{I_i} + L_{C_i} \\
M_i &= M_{I_i} + M_{C_i} \\
N_i &= N_{I_i} + N_{C_i}
\end{aligned}
\tag{1-111}
$$

There are no gravity and aerodynamic moments. The terms of Equation (1-111) come from Equations (1-5), (1-8), (1-62) and (1-110).

1.3.7 Rigid-Body Equations of Motion

Having obtained all the forces and moments acting on each mass m_i, the rigid-body equations of motion for mass m_i can be written. Euler's equations of motion are used. These are derived in Reference 1; the derivation is not repeated here. The body axis components of the absolute (relative to ground) translational velocity of mass m_i are denoted by u_i, v_i, and w_i. The corresponding rotational velocities are designated p_i, q_i, and r_i. These velocities are shown in the following sketch:



Euler's equations of motion are six equations for the time derivatives of the six velocities, in terms of the six total forces and moments from the preceding section, the velocities themselves, and the inertia properties of mass m_i. These equations are (from Reference 1):

$$\dot{u}_i = \frac{X_i g}{W_i} - q_i w_i + r_i v_i$$

$$\dot{v}_i = \frac{Y_i g}{W_i} - r_i u_i + p_i w_i$$

$$\dot{w}_i = \frac{Z_i g}{W_i} - p_i v_i + q_i u_i$$

$$\dot{p}_i = \frac{1}{\Delta_i}\left[\begin{array}{l}\left(L_i - A_i\right)\left(I_{y_i} I_{z_i} - I_{yz_i}^2\right) + \left(M_i - B_i\right)\left(I_{xy_i} I_{z_i} + I_{yz_i} I_{xz_i}\right) \\ +\left(N_i - C_i\right)\left(I_{xy_i} I_{yz_i} + I_{y_i} I_{xz_i}\right)\end{array}\right] \tag{1-112}$$

$$\dot{q}_i = \frac{1}{\Delta_i}\left[\begin{array}{l}\left(L_i - A_i\right)\left(I_{xy_i} I_{z_i} + I_{yz_i} I_{xz_i}\right) + \left(M_i - B_i\right)\left(I_{x_i} I_{z_i} - I_{xz_i}^2\right) \\ +\left(N_i - C_i\right)\left(I_{x_i} I_{yz_i} + I_{xz_i} I_{xy_i}\right)\end{array}\right]$$

$$\dot{r}_i = \frac{1}{\Delta_i}\left[\begin{array}{l}\left(L_i - A_i\right)\left(I_{xy_i} I_{yz_i} + I_{y_i} I_{xz_i}\right) + \left(M_i - B_i\right)\left(I_{x_i} I_{yz_i} + I_{xz_i} I_{xy_i}\right) \\ +\left(N_i - C_i\right)\left(I_{x_i} I_{y_i} - I_{xy_i}^2\right)\end{array}\right]$$

where

$$\Delta_i = I_{x_i}\left(I_{y_i}I_{z_i} - I_{yz_i}^2\right) - I_{xy_i}\left(I_{xy_i}I_{z_i} + I_{xz_i}I_{yz_i}\right) - I_{xz_i}\left(I_{xy_i}I_{yz_i} + I_{y_i}I_{xz_i}\right)$$

$$A_i = q_i\left(He_{z_i} - I_{xz_i}p_i - I_{yz_i}q_i + I_{z_i}r_i\right) - r_i\left(He_{y_i} - I_{xy_i}p_i + I_{y_i}q_i - I_{yz_i}r_i\right)$$

$$B_i = r_i\left(He_{x_i} + I_{x_i}p_i - I_{xy_i}q_i - I_{xz_i}r_i\right) - p_i\left(He_{z_i} - I_{xz_i}p_i - I_{yz_i}q_i + I_{z_i}r_i\right) \qquad (1\text{-}113)$$

$$C_i = p_i\left(He_{y_i} - I_{xy_i}p_i + I_{y_i}q_i - I_{yz_i}r_i\right) - q_i\left(He_{x_i} + I_{x_i}p_i - I_{xy_i}q_i - I_{xz_i}r_i\right)$$

X_i, Y_i, Z_i, L_i, M_i, and N_i are the total forces and moments from Equation (1-111). I_{xi}, I_{yi}, and I_{zi} are the moments of inertia of mass m_i about its body fixed axes. I_{xyi}, I_{yzi}, and I_{xzi} are the products of inertia, e.g., $I_{xyi} = \int x_i y_i dm_i$, etc. H_{exi}, H_{eyi}, and H_{ezi} are the angular momenta of masses m_i, due to rotation of internal masses within m_i, such as propellers, rotors, and engine turbines.

The above equations of motion are integrated numerically to yield u_i, v_i, w_i, and p_i, q_i, r_i. The translational velocities are obtained in ground axes by a simple transformation.

$$\begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix} = [A_i] \begin{Bmatrix} u_i \\ v_i \\ w_i \end{Bmatrix} \qquad (1\text{-}114)$$

Similarly, the angular velocities p_i, q_i, and r_i are the body axes components of the instantaneous absolute rotation rate $\vec{\omega}_i$ of mass m_i. These variables do not correspond to any set of coordinates which specify the

orientation of the airplane. Therefore, in order to solve for the orientation, it is necessary to transform the p', q', r' to the time derivatives $\dot{\phi}_i$, $\dot{\theta}_i$, $\dot{\psi}_i$ of the Euler angles. By summing the orthogonal projections of $\dot{\phi}_i$, $\dot{\theta}_i$, $\dot{\psi}_i$ onto each of the body fixed axes, the following kinematic relations are obtained (Reference 1):

$$\dot{\phi}_i = p_i + (q_i \sin\phi_i + r_i \cos\phi_i) \tan \theta_i$$

$$\dot{\theta}_i = q_i \cos\phi_i - r_i \sin\phi_i \tag{1-115}$$

$$\dot{\psi}_i = (q_i \sin\phi_i + r_i \cos\phi_i) \sec \theta_i$$

Equations (1-114) and (1-115) are integrated numerically to obtain x_i, y_i, z_i and ϕ_i, θ_i, ψ_i. Also, p_i, q_i, and r_i are integrated to obtain the quantities inp_i, inq_i, and inr_i. The incremental changes in these integrals are used in Equation (1-12). They represent the incremental rotations of mass m_i in body fixed axes.

It should be noted that ($\dot{u}_i$, $\dot{v}_i$, $\dot{w}_i$) from Equation (1-112) are not the components of the absolute acceleration of m_i. The expressions for these quantities are:

$$ax_i = \frac{X_i}{W_i}$$

$$ay_i = \frac{Y_i}{W_i} \tag{1-116}$$

$$az_i = \frac{Z_i}{W_i}$$

where the accelerations are in g units. These are used only for output data in program KRASH. Comparing Equations (1-112) and (1-116), the relationships between the absolute accelerations and the time derivatives of the body axis components of the absolute velocity are seen to be:

$$ax_i = \frac{1}{g}\left[\dot{u}_i + q_i w_i - r_i v_i\right]$$

$$ay_i = \frac{1}{g}\left[\dot{v}_i + r_i u_i - p_i w_i\right] \qquad (1\text{-}117)$$

$$az_i = \frac{1}{g}\left[\dot{w}_i + p_i v_i - q_i u_i\right]$$

These relationships can be independently derived from the time derivative of the absolute velocity, accounting for the time rate of change of the unit vectors fixed in the body.

1.3.8 Filtered Accelerations

Program KRASH has been extensively used in conjunction with full scale crash tests, wherein it is desired to establish the degree of correlation between analytical and test results. The most readily obtainable test results are measured accelerations at various points on the structure. Since crash test accelerometer outputs generally contain a great deal of very high frequency, high amplitude responses, the data is normally filtered prior to its usage or formal presentation. A wide variety of analog and digital filters may be employed, but in general the cutoff frequency is in the area of 100 Hz to 300 Hz.

In order to facilitate comparisons of KRASH analytical results with test results, the calculation of filtered mass accelerations is included in the program. The filter employed in the program is a simple first order lag. The Laplace transform for such a filter is given by:

$$T(\omega) = \frac{1}{1 + j\frac{\omega}{\omega_c}} \qquad (1\text{-}118)$$

where

$j = \sqrt{-1}$

ω = response frequency, rad/sec

ω_c = cutoff frequency of filter, rad/sec

The phase and amplitude response for this filter is shown in Figure 1-14. Although the filters used for test data reduction are generally much steeper, it is felt that the computational effort (and run time) required for a more complex filter is not appropriate for inclusion in the direct time-history solution of program KRASH.

The first order filter is implemented through the following equation in the time domain:

$$p\dot{y} + y = x \tag{1-119}$$

where

$$x = \text{unfiltered acceleration (input) time history}$$

$$y = \text{filtered acceleration (output) time history}$$

$$\dot{y} = \frac{d}{dt}\, y(t) \tag{1-120}$$

$$p = \frac{1}{\omega_c} = \frac{1}{2\pi f_c}$$

The filter cutoff frequency f_c is an input parameter.

Equation (1-119) is solved for $\dot{y}$:

$$\dot{y} = \frac{x-y}{p} \tag{1-121}$$

This derivative is then integrated directly along with the other integrations performed in the program to yield y(t) which is the desired filtered acceleration. This procedure is employed for all the linear accelerations for all the masses in the model. The unfiltered accelerations used for the input to (1-121) are those from Equation (1-116), which are in g units. Therefore, the filtered accelerations are also in g units.

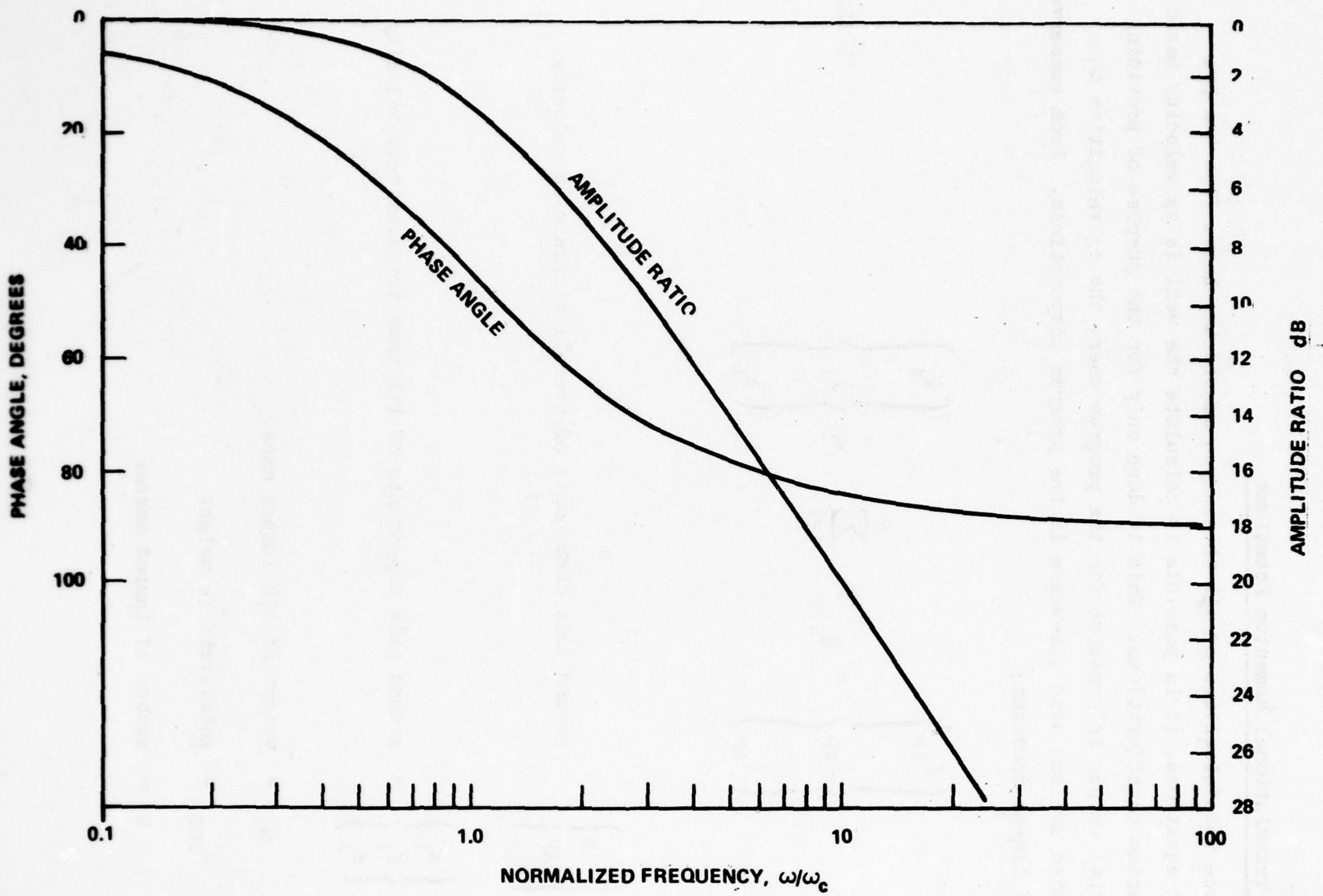


Figure 1-14. First Order Filter Response Characteristics

1.3.9 Translational Momentum Equations

Once the velocities of all the lumped masses are known from the preceeding equations, it is possible to calculate the vehicle cg velocity based on momentum considerations. This is done only for the purpose of providing additional output information for the program user; the cg velocities thus calculated are not used elsewhere in the program computations. From conservation of linear momentum:

$$\begin{Bmatrix} \dot{x}_{AP} \\ \dot{y}_{AP} \\ \dot{z}_{AP} \end{Bmatrix} = \frac{1}{W_{TOT}} \sum_{i=1}^{N} W_i \begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix} \tag{1-122}$$

where

$\begin{Bmatrix} \dot{x}_{AP} \\ \dot{y}_{AP} \\ \dot{z}_{AP} \end{Bmatrix}$ = ground axis components of overall airplane cg velocity

$\begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix}$ = ground axis components of ith mass translational velocity

W_i = weight of ith lumped mass

W_{TOT} = total vehicle weight

N = number of lumped masses

The results of Equation (1-122) are printed at every print time interval. This information is useful for giving the program user an indication of the translational velocity state of the vehicle as a whole, which is very difficult to deduce from inspection of the velocities of all the lumped masses.

A similar calculation could be performed for the angular velocity of the vehicle. However, since the angular inertia properties in ground axes are dependent on mass orientation, the moments of inertia for all the lumped masses would have to be continually calculated in ground axes, as would the angular velocities of the masses, since their spatial attitude varies with time. Alternatively, the angular velocities and inertias could all be calculated in some reference frame approximating the overall vehicle attitude. In either case, it is felt that the complexity of the necessary calculations outweighs any potential benefits from the overall airplane angular velocities that could be derived. Therefore, average airplane angular velocities are not calculated.

1.3.10 Control Volume Mass Penetration Calculations

The computer program includes the calculation of whether or not any of the N lumped masses have penetrated into an input control volume. The purpose of these calculations is to determine if a major mass item (such as the engine) has moved into a position where it threatens the vehicle's passengers. Therefore, the control volume input is intended to define the volume of the vehicle in which human occupants are present. The rectangular control volume is located with respect to one of the lumped masses, which is specified in the input. Figure 1-15 shows a typical rectangular control volume defined with respect to mass m_p.

The six walls of the control volume are always perpendicular to the three body axes fixed in mass m_p. Thus, the spatial orientation of the control volume varies as mass m_p rotates. $\bar{x}_p$, $\bar{x}_n$, $\bar{y}_p$, $\bar{y}_n$, $\bar{z}_p$, and $\bar{z}_n$, all positive, are the input constants defining the distances from m_p to the six walls, measured in the positive and negative directions along the body fixed axes of m_p.

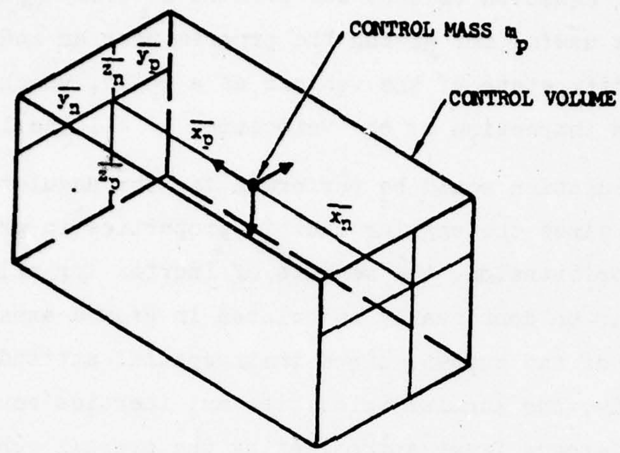


Figure 1-15. Control Volume for Mass Penetration

Mass penetration is determined by merely examining the pth body axes components of a vector from control mass m_p to mass m_i, $i = 1,2,\ldots,N$ $(i \neq p)$. These components are given simply by

$$\begin{Bmatrix} x_{p_i} \\ x_{p_i} \\ z_{p_i} \end{Bmatrix} = [A_p]^T \begin{Bmatrix} x_i - x_p \\ y_i - y_p \\ z_i - z_p \end{Bmatrix} \quad i = 1,2,\ldots,N(i \neq p) \qquad (1\text{-}123)$$

where $[A_p]$ is the transformation matrix $[A_i]$ for $i = p$. These vector components are then tested against the control volume dimensions. If all three vector components lie within the corresponding pairs of control volume walls,

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GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MAN--ETC(U)
FEB 78 M A GAMON DOT-FA75WA-3707
UNCLASSIFIED LR-28307 FAA/RD-77/189-VOL-1 NL

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then the ith point has penetrated inside the control volume. Whenever a mass penetration occurs, the program prints out the time and mass that penetrated. These data are repeated in a summary table at the end of the run, showing all the mass penetrations for that run.

1.3.11 Volume Change Calculations

In order to determine the potential for occupant injury in a crash, the program includes the capability to calculate the change in volume of a region defined by eight (8) corner point masses. In practice, the volume specified would represent the region in which human occupants are located. Figure 1-16 illustrates a typical volume specified by defining the mass numbers at the corner points 1-8.

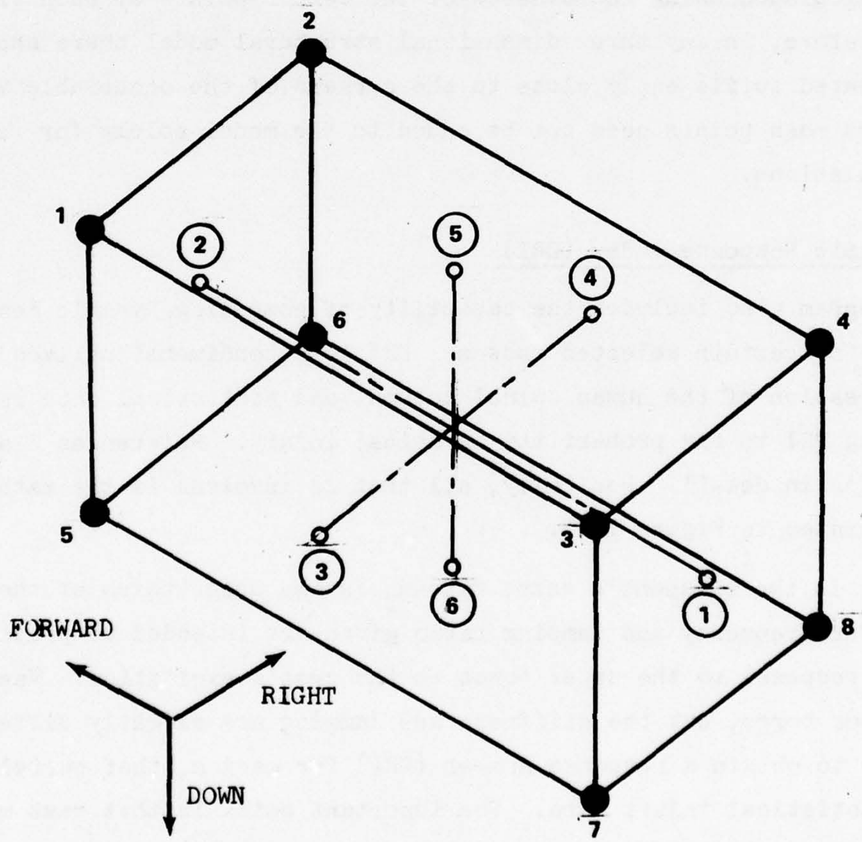


Figure 1-16. Volume Change Geometry

The program calculates the x, y, z ground coordinates of the circled points ① through ⑥ as the average of the coordinates of the appropriate 4 mass points. For example, to calculate the coordinate of ⑤, the coordinates of masses located at 1, 2, 3 and 4 are used. When the ground coordinates of ① through ⑥ are known, the lengths of lines ① - ②, ③ - ④ and ⑤ - ⑥ are computed. These are then multiplied to obtain the volume. Both the volume and the lengths of lines ① - ②, ③ - ④, and ⑤ - ⑥ are printed at each print time interval. The program allows for up to 8 separate volumes to be specified, so that different occupant regions can be separately analyzed.

While Figure 1-16 implies that 8 masses must be located in the model in a perfectly rectangular pattern, sloping planes are acceptable since the volume is calculated using coordinates of the center points of each side plane. Therefore, in any three dimensional structural model there should be 8 masses located sufficiently close to the corners of the occupiable volume, so that extra mass points need not be added to the model solely for volume change calculations.

1.3.12 Dynamic Response Index (DRI)

The program also includes the capability of computing Dynamic Response Index (DRI) for certain selected masses. DRI is a nondimensionalized measure of the compression of the human spinal column, and statistical data is available relating DRI to the probability of spinal injury. References 2 and 3 describe DRI's in detail. Basically, all that is involved is the mathematical model illustrated in Figure 1-17.

Mass m_1 is the occupant's seat; mass m_2 is the upper torso of the occupant. The frequency and damping ratio given are intended to properly model the dynamic response to the upper torso to the seat's excitation. Mass m_3 is also the upper torso, but the stiffness and damping are slightly different. This is done to obtain a response number (DRI) for mass m_3 that correlates well with statistical injury data. The important point is that mass m_3 is driven by mass m_1, but the interconnecting forces only drive mass m_3, not

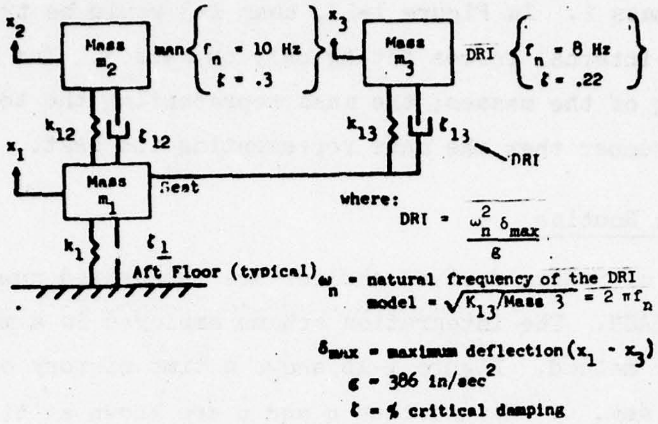


Figure 1-17. DRI Model

mass m_1. Thus, the coupled systems of m_1 and m_2 determine the response of m_1, and this response drives m_3. The Dynamic Response Index is defined in Figure 1-17 by

$$DRI = \frac{\omega_n^2 \delta}{g} \tag{1-124}$$

Substituting the constants, the DRI is:

$$DRI = 6.55\delta \tag{1-125}$$

If the damping were zero, the DRI would be the acceleration of mass m_3. With damping, it is a nondimensionalized measure of spring compression. In the computer program, δ is taken as $-vx$ (Equation 1-44)) for the ij element corresponding to the beam between mass 1 and 3. The program is coded so that for selected ij pairs (specified by the input), the internal force acts only

on mass j, not on mass i. In Figure 1-17, beam 1-3 would be treated in this way, with its internal forces acting only on mass 3. The only restriction is in the numbering of the masses; the mass representing the torso must be assigned a larger number than the mass representing the seat.

1.3.13 Integration Routine

The equations of motion derived earlier are integrated numerically in computer program KRASH. The integration scheme employed is a modified predictor-corrector method. Figure 1-18 shows a time history of a typical response quantity, say, u. Assume that u and $\dot{u}$ are known at time t and all previous times. The predicted value of u at t + Δt, $u_{p_{t+\Delta t}}$ is computed as

$$u_{p_{t+\Delta t}} = u_{t-\Delta t} + 2\Delta t \dot{u}_t \qquad (1\text{-}126)$$

This is shown in the Figure 1-18 by the upper dashed line of slope $\dot{u}_t$. Using this predicted value of u at t + Δt, the derivative $\dot{u}$ at t + Δt is

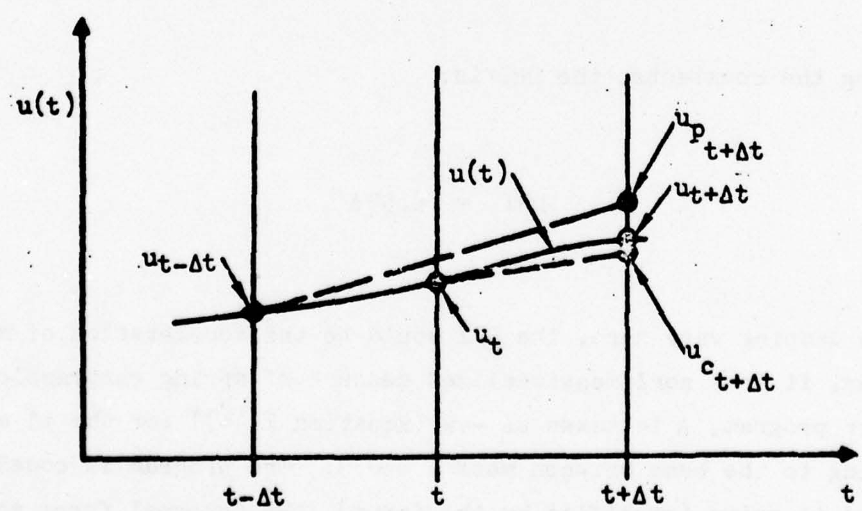


Figure 1-18. Numerical Integration Scheme

computed from the equations derived in the theory. This derivative is then averaged with $\dot{u}$ at t to determine a corrected value of u at t + Δt:

$$u_{c_{t+\Delta t}} = u_t + \frac{\Delta t}{2}(\dot{u}_{t+\Delta t} + \dot{u}_t) \tag{1-127}$$

This is shown by the lower dashed line in Figure 1-18. The final value used for $u_{t+\Delta t}$ is a weighted average of the predicted and corrected values. For the present program, the weighting used is 4 to 1 in favor of the corrected value. Hence

$$u_{t+\Delta t} = 0.8u_{c_{t+\Delta t}} + 0.2u_{p_{t+\Delta t}} \tag{1-128}$$

A computational flow diagram for this scheme is shown in Figure 1-19. Since the technique is not self-starting (due to the $u_{t-\Delta t}$ term in equation (1-126)), a simple Euler integration is used for the first step. The subroutine DERIV encompasses all the equations derived in the theory, and is used to compute the derivatives of all the variables, knowing the variables themselves.

The iteration shown by the dashed line in Figure 1-19 is often employed with this scheme, the iteration continuing until the predicted and corrected values agree to within a specified tolerance. However, the iteration is not used in the program KRASH. Due to the large number of computations in the subroutine DERIV, it is more efficient to go through DERIV only once per time step, and to choose a sufficiently small time step Δt to obtain the desired accuracy.

The subroutine IC computes all the initial values (at t = 0) of the variables necessary for the integration to proceed. Section 1.3.15 discusses the calculations of these initial conditions.

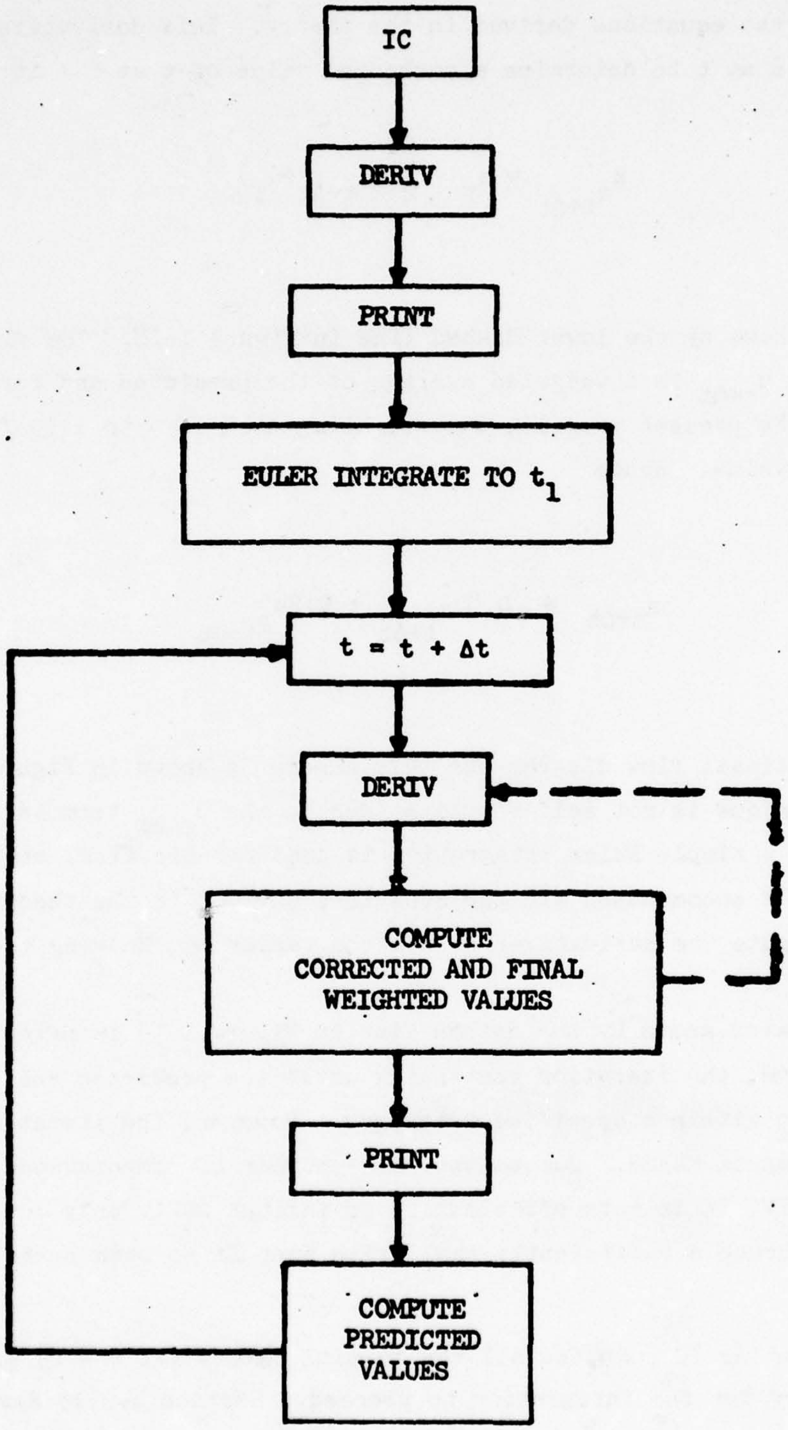


Figure 1-19. Numerical Integration Flow Diagram

1.3.14 Symmetrical Modeling

Program KRASH is coded to allow the analysis of a half-airplane model for symmetrical impact conditions. Figure 1-20 illustrates a very simple model of an airplane, in which masses 1, 2 and 3 represent the fuselage, 4 and 5 side fuselage structure, 6 the landing gear and 7 the wing. If the airplane itself is symmetrical, which is normally the case, then the program user need only input data for masses 1 through 7. Beam data is input for the following ij pairs:

1 - 2
2 - 3
2 - 4
4 - 5
4 - 6
5 - 0
5 - 7

The notation 5-0 means that a beam connects mass 5 to an equal mass on the opposite side of the airplane. (Mass 9 is not input to the model, so beam 5-9 cannot be input.) Program KRASH then analyzes the response of the model consisting of the left hand side of the airplane only, for a symmetrical impact condition. A symmetrical impact is one containing no roll or yaw angles, no lateral cg velocity, and no roll and yaw angular velocities.

For the half-airplane analysis, the "missing" half of the airplane is accounted for in the following manner:

- For traverse beams such as 5-0, the conditions at beam end j are set equal to those at i, with appropriate changes in sign. x, z and θ motions are equal; y, ϕ and ψ motions are opposite.
- The X, Z and M internal beam loads acting on a mass on the plane of symmetry are doubled to account for the presence of opposite side beams that are not explicitly modeled. Prior to this, loads for beams lying entirely in the plane of symmetry (such as 1-2 and 2-3 in Figure 1-20) are halved. This is done so that when the X, Z and M internal loads are doubled on a mass such as 2, the contribution from beams such as 1-2 will not be doubled. Y, L and N loads are set to zero.

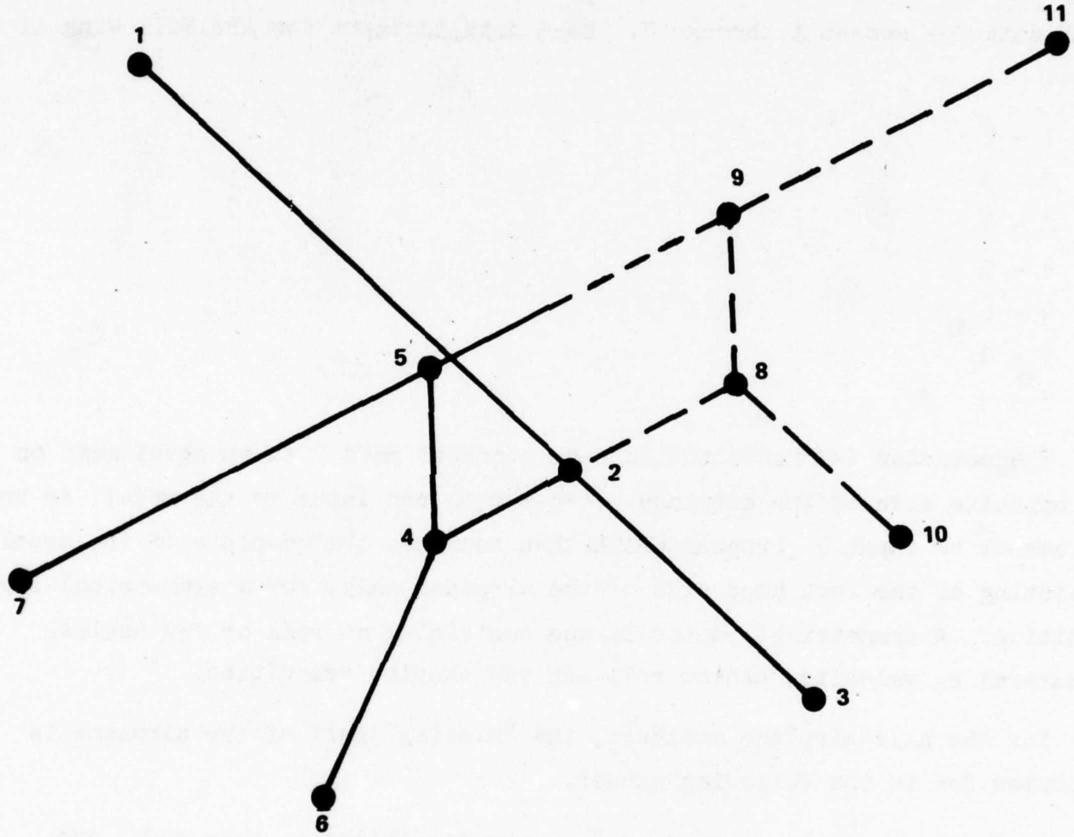


Figure 1-20. Symmetrical Airplane Model

The input data defining the characteristics of beams in the plane of symmetry, such as 1-2, should include the contributions from both the left and right hand sides of the airplane. The same is true for mass data for masses in the plane of symmetry, such as 1, 2 and 3. In other words, "half-airplane" data is *not* utilized for beams or masses in the plane of symmetry. While this convention differs from that used in certain other standard structural analysis computer programs, it is consistent with the full airplane models used with previous versions of KRASH.

For unsymmetrical impact conditions, the program user can still input a half-airplane model. For this situation, the program internally generates the rest of the model and performs the analysis using a full-airplane model. For example, the program would internally generate the data for masses 8, 9, 10 and 11 in Figure 1-20, as well as beams 2-8, 8-9, 8-10 and 9-11. Therefore, the program user can always work with a reduced size data set representing half an airplane, as long as the airplane itself is symmetrical. Any change made to the half-airplane data set will automatically be included in the opposite mass or beam when the program generates the full-airplane model.

1.3.15 Initial Conditions

Initial values (at t = 0) are required for the following quantities:

$$\left.\begin{matrix} x_i,\ y_i,\ z_i & \phi_i,\ \theta_i,\ \psi_i \\ u_i,\ v_i,\ w_i & p_i,\ q_i,\ r_i \\ \dot{x}_i,\ \dot{y}_i,\ \dot{z}_i & \dot{\phi}_i,\ \dot{\theta}_i,\ \dot{\psi}_i \end{matrix}\right\} \quad i = 1,2,\ldots,N \qquad (1\text{-}129)$$

The initial conditions which are input to the program are the following:

$\dot{x}_g, \dot{y}_g, \dot{z}_g$	**vehicle c.g. velocity in ground axes**
p', q', r'	**vehicle angular velocity in body axes**
ϕ', θ', ψ'	**vehicle attitude, Euler angles of vehicle relative to ground**

First the total vehicle weight is computed from the individual mass weights (input):

$$W_{TOT} = \sum_{i=1}^{N} W_i \tag{1-130}$$

Next, the location of the overall vehicle c.g., in the Hx"y"z" coordinate system, is determined as follows:

$$\begin{aligned} x''_G &= \frac{1}{W_{TOT}} \sum_{i=1}^{N} W_i x''_i \\ y''_G &= \frac{1}{W_{TOT}} \sum_{i=1}^{N} W_i y''_i \\ z''_G &= \frac{1}{W_{TOT}} \sum_{i=1}^{N} W_i z''_i \end{aligned} \tag{1-131}$$

An expression for the ground coordinates of m_i is written:

$$\begin{Bmatrix} x_i \\ y_i \\ z_i \end{Bmatrix} = \begin{Bmatrix} x_G \\ y_G \\ z_G \end{Bmatrix} + [A'] \begin{Bmatrix} x'_i \\ y'_i \\ z'_i \end{Bmatrix} \tag{1-132}$$

or

$$va_{ij} = vg_j + \sum_{l=1}^{3} A'_{jl} vip_{il} \qquad j = 1,2,3$$

where x_G, y_G, and z_G are currently unknown, and

$$\begin{Bmatrix} x_i' \\ y_i' \\ z_i' \end{Bmatrix} = - \begin{Bmatrix} x_i'' - x_G'' \\ y_i'' - y_G'' \\ z_i'' - z_G'' \end{Bmatrix} \qquad (1\text{-}133)$$

or

$$vip_{ij} = -(vipp_{ij} - vgpp_{ij}) \qquad j = 1,2,3$$

The $vipp_{ij}$ are the input coordinates of the m_i, and the $vgpp_{ij}$ were computed in Equation (1-131), so the vip_{ij} are known. In Equation (1-132), $[A']$ is known from the input Euler angles ϕ', θ', and ψ'. The only unknowns in Equation (1-132) are x_G, y_G, z_G (defined as vg_j). Clearly, the y ground coordinate of the initial c.g. position is arbitrary, so this is set to zero.

It remains to determine the initial c.g. position, both fore-aft and vertically. This position is determined within the program so that the vehicle, in the desired attitude with respect to ground, "fits into" the wedge formed by the ground plane and slope with the lowest springs .001 inch off the ground and slope. This situation is illustrated in Figure 1-21. Point 0 is the origin of the ground coordinate system, with x positive forward and z positive down. Point 0 is located at the intersection of the horizontal ground plane and the slope. The vehicle cg is shown in Figure 1-21. The initial coordinates of the c.g. in ground axes, shown as x_G and z_G in Figure 1-21, are desired. Also shown are two typical masses m_i and m_j, with external springs radiating outward.

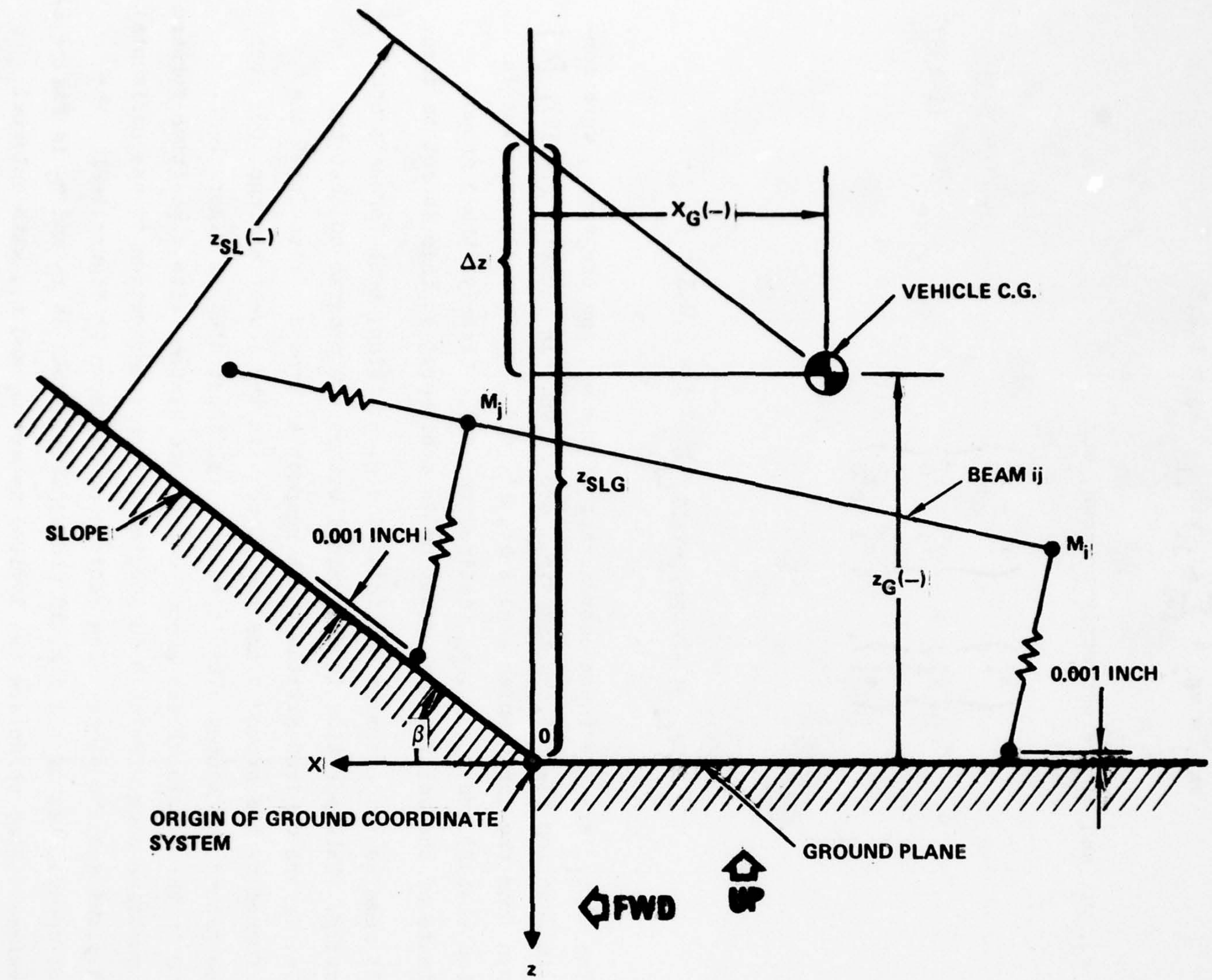


Figure 1-21. Vehicle Initial Position

The procedure for determining x_G and z_G is:

1. Write equations for the ground and slope coordinates of the end points of all the external springs in the model, assuming the vehicle cg is located at point 0.
2. Search for the largest magnitude of these distances, both in ground and slope axes.
3. From this information, calculate z_{SL} and z_G to give .001 inch ground clearance at the spring ends.
4. Finally, calculate x_G.

From Equation (1-69), the z coordinate of the end of spring ik is known as:

$$vc_{i3k} = va_{i3} + dvr_{i3} + dvc_{i3k} \tag{1-134}$$

From Equation (1-132) va_{i3} is:

$$va_{i3} = vg_3 + \sum_{\ell=1}^{3} A'_{3\ell}\, vip_{i\ell} \tag{1-135}$$

once $vg_3(z_G)$ is known. Combining (1-134) and (1-135) and utilizing (1-71) for dvc_{ijk}:

$$vc_{i3k} = vg_3 + \sum_{\ell=1}^{3} A'_{31}\, vip_{i\ell} + dvr_{i3} + A_{i3K}\bar{\ell}_{ik} \tag{1-136a}$$

The x coordinates are obtained similarly as

$$vc_{i1k} = vg_1 + \sum_{\ell=1}^{3} A'_{1\ell}\, vip_{i\ell} + dvr_{j1} + A_{i1k\ ik} \tag{1-136b}$$

Now the x and z coordinates of all the spring ends are calculated using Equation (1-136) with $vg_1 = vg_3 = 0$ (vehicle c.g. at point 0). The zsl slope axis coordinate is calculated also for all the spring ends. This is given simply by

$$zs\ell_{ik} = \sin\beta \; (vc_{i1k}) + \cos\beta \; (vc_{i3k}) \tag{1-137}$$

The results of equations (1-136a) and (1-137) are now searched for the maximum magnitudes:

$$\begin{aligned} zc_{max} &= \left| \text{largest} \left| vc_{i3k} \right| \right| \text{ for all ik pairs} \\ z_{SL_{max}} &= \left| \text{largest} \left| zsl_{ik} \right| \right| \text{ for all ik pairs} \end{aligned} \tag{1-138}$$

The calculation of z_G and z_{SL}, shown in Figure 1-21, is now possible. These are given by

$$\begin{aligned} z_G &= -z_{C_{MAX}} \quad -.001 \\ z_{SL} &= -z_{SL_{MAX}} \quad -.001 \end{aligned} \tag{1-139}$$

It still remains to calculate x_G from z_G and z_{SL}. (z_G and z_{SL} uniquely define the vehicle c.g. position, but we want x_G and z_G, not z_{SL} and z_G, for use in equation (1-132).)

Obtain first the projection of z_{SL} on the vertical Oz axis as

$$z_{SLG} = -z_{SL}/\cos\beta \tag{1-140}$$

Then Δz is given by

$$\Delta z = -z_G - z_{SLG} \tag{1-141}$$

Finally x_G is computed as

$$x_G = \Delta z/\tan\beta \qquad (1\text{-}142)$$

For $\beta = 0$, don't use equations (1-140) through (1-142), but set $x_G = 0$. For $\beta = 90$, set $x_G = z_{SL}$ (both are negative). Finally, modify the calculated values of x_G and z_G by the input values x_{GIN} and z_{GIN}:

$$x_G = x_G - x_{GIN}$$

Equation (1-142)

(1-143)

$$z_G = z_G - z_{GIN}$$

Equation (1-139)

Positive input constants x_{GIN} and z_{GIN} define the distances aft and up in ground axes that the initial c.g. position is relative to the "wedged" position shown in Figure 1-21. Normally these are input as zero, since the "wedged" position is where one usually wants the vehicle. However, for certain special cases it may be desired to drop the vehicle a finite distance or to impact entirely on the slope. It should be noted that the z_G in Equation (1-143) is actually used to calculate Δz in Equation (1-141). This means that if a nonzero z_{GIN} is used, the vehicle will be lifted up from the "wedged" position and then moved forward until almost contacting the slope. Thus one can start any distance up the slope to get clear of the ground plane if so desired. The slope extends indefinitely. With x_G and z_G now known (and y_G set = 0), we can use Equation (1-132) to calculate the initial values for all the mass ground coordinates.

In determining the initial position of the airplane, only the mass points having external springs are checked. The program assumes that the user has assigned springs to the masses at the lower extremities of the vehicle. If this is not the case, the program may place the vehicle in an initial position wherein some of the masses are below the ground plane ($z = 0$). This will

manifest itself by negative potential energy for any "subterranean" masses. If this occurs, the user should correct the model by adding external springs to the lowest masses.

To perform the preceding calculations, $\left[A_i\right]$ is required, which is used in Equations (1-136a, b). From the definitions of the transformation matrices (refer to Table 1-1 earlier):

$$[A_i] = \underbrace{[A']}_{\text{c.g. axes to ground axes}}\underbrace{[A''_i]}_{\text{ith body axes to c.g. axes}} \qquad i = 1,2,\ldots,N \tag{1-144}$$

Equation (1-144) also provides a method for determining the initial values for ϕ_i, θ_i, ψ_i. First θ_i is determined from $A_{i31} = -\sin\theta_i$ as

$$\theta_i = -\sin^{-1} A_{i31} \tag{1-145}$$

Next ϕ_i is found from $A_{i32} = \sin\phi_i \cos\theta_i$, since θ_i is now known:

$$\phi_i = \sin^{-1}\left(\frac{A_{i32}}{\cos\theta_i}\right) \tag{1-146}$$

Finally, ψ_i is obtained from $A_{i21} = \cos\theta_i \sin\psi_i$:

$$\psi_i = \sin^{-1}\left(\frac{A_{i21}}{\cos\theta_i}\right) \tag{1-147}$$

Note that equations (1-145) through (1-147) all involve arc sine, so the difference between a positive and negative angle can be detected.

Next the linear and angular velocities are calculated. Differentiating equation (1-132):

$$\begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix} = \begin{Bmatrix} \dot{x}_G \\ \dot{y}_G \\ \dot{z}_G \end{Bmatrix} + [\dot{A}'] \begin{Bmatrix} x_i' \\ y_i' \\ z_i' \end{Bmatrix} \tag{1-148}$$

where the first vector is input and the second vector is given by Equation (1-133). $[\dot{A}']$ is treated the same as $[\dot{A}_i]$ was earlier in the theory:

$$[\dot{A}'] = [A'] [D'] \tag{1-149}$$

where

$$[D'] = \begin{bmatrix} 0 & -r' & q' \\ r' & 0 & -p' \\ -q' & p' & 0 \end{bmatrix} \tag{1-150}$$

p', q' and r' are input constants defining the initial vehicle angular velocity.

Once $\dot{x}_i$, $\dot{y}_i$, and $\dot{z}_i$ are known from (1-148), these are simply transformed into body axes to obtain u_i, v_i, and w_i:

$$\begin{Bmatrix} u_i \\ v_i \\ w_i \end{Bmatrix} = [A_i]^T \begin{Bmatrix} \dot{x}_i \\ \dot{y}_i \\ \dot{z}_i \end{Bmatrix} \tag{1-151}$$

The angular velocities in body axes (p_i, q_i, and r_i) are equal to the vehicle angular velocity (p', q', and r'), transformed from c.g. axes to ith mass axes:

$$\begin{Bmatrix} p_i \\ q_i \\ r_i \end{Bmatrix} = [A_i'']^T \begin{Bmatrix} p' \\ q' \\ r' \end{Bmatrix} \qquad (1\text{-}152)$$

Next we determine $\dot{\phi}_i$, $\dot{\theta}_i$, and $\dot{\psi}_i$ by Equation (1-115).

$$\begin{Bmatrix} \dot{\phi}_i \\ \dot{\theta}_i \\ \dot{\psi}_i \end{Bmatrix} = [\bar{A}_i] \begin{Bmatrix} p_i \\ q_i \\ r_i \end{Bmatrix} \qquad (1\text{-}153)$$

where

$$[\bar{A}_i] = \begin{bmatrix} 1 & \sin\phi_i \tan\theta_i & \cos\phi_i \tan\theta_i \\ 0 & \cos\phi_i & -\sin\phi_i \\ 0 & \sin\phi_i \sec\theta_i & \cos\phi_i \sec\theta_i \end{bmatrix} \qquad (1\text{-}154)$$

The only remaining initial conditions to be determined are the beam deflections and forces. At present, the program is written so that the initial values for these quantities are zero. This is only true for the case where there are no aerodynamic loads, so that all masses are uniformly accelerating downward at 1g. Therefore, if aerodynamic loads are used in the program, the initial conditions will not be correct since internal forces would be required to balance the aerodynamic and gravity forces. However, this is not considered a serious limitation since the dynamic impact forces in a crash situation will overshadow any imbalance present due to nonzero aerodynamic forces.

In the IC subroutine, the overall vehicle moments of inertia are calculated from the individual mass inertia data, to inform the user as to how well his model matches the overall inertias of the vehicle being analyzed. The overall inertias are given by

$$I_x = \sum_{i=1}^{NM} \left(I_{xi} + m_i \, r_{xi}^2 \right)$$

$$I_y = \sum_{i=1}^{NM} \left(I_{yi} + m_i \, r_{yi}^2 \right) \qquad (1\text{-}155)$$

$$I_z = \sum_{i=1}^{NM} \left(I_{zi} + m_i \, r_{zi}^2 \right)$$

The I_{xi}, I_{yi}, I_{zi} are the individual mass moments of inertia, the m_i are the individual masses, and r_{xi}^2, r_{yi}^2, r_{zi}^2 are the squares of the distances from the cg to m_i, measured normal to the Hx"y"z" axes as appropriate.

$$r_{xi}^2 = (y_i'' - y_G'')^2 + (z_i'' - z_G'')^2$$

$$r_{yi}^2 = (x_i'' - x_G'')^2 + (z_i'' - z_G'')^2 \qquad (1\text{-}156)$$

$$r_{zi}^2 = (x_i'' - x_G'')^2 + (y_i'' - y_G'')^2$$

1.3.16 Energy Balance Equations

The primary objective of a crash analysis in the preliminary design phase is to determine how to absorb the initial vehicle kinetic energy while maintaining a livable environment for the occupants. This task is greatly facilitated if information regarding the spatial distribution of the energy flow through the vehicle is available. With this objective in mind, energy balance equations are developed. These equations do not alter the previously described computational procedures; they merely provide additional information to assist in understanding how the initial kinetic energy is absorbed.

The total system energy at any time is given by the following expression:

$$E_{TOT} = KE + PE + SE + DE + CE + FE \tag{1-157}$$

where

E_{TOT} = Total system energy

KE = Total kinetic energy

PE = Total potential energy

SE = Total strain energy absorbed

DE = Total damping energy dissipated

CE = Total crushing (external spring) energy absorbed

FE = Total friction energy dissipated by sliding of external springs on the ground

The total system energy E_{TOT} remains constant during the analysis. The total kinetic and potential energies result from summing the energies for each mass over the number of masses (NM).

$$KE = \sum_{i=1}^{NM} KE_i \qquad PE = \sum_{i=1}^{NM} PE_i \tag{1-158}$$

The total strain and damping energies are obtained by summing the strain and damping energy for each internal beam element (ij pair) over the NB ij pairs.

$$SE = \sum_{ij=1}^{NB} SE_{ij} \qquad DE = \sum_{ij=1}^{NB} DE_{ij} \tag{1-159}$$

SE_{ij} results from the elastic-plastic behavior of the beam, and DE_{ij} results from its damping properties. The total crushing and friction energies result from summing the energies for all the individual crash springs (ik pairs) over all the NSP ik pairs.

$$FE = \sum_{ik=1}^{NSP} FE_{ik} \qquad CE = \sum_{ik=1}^{NSP} CE_{ik} \tag{1-160}$$

Referring to Equation (1-157), at time zero all energies are zero except KE, PE and E_{TOT}. The potential energy is referenced to the ground plane. After impact with the ground, the kinetic energy decreases, and the potential energy may increase or decrease. Damping, strain, crushing and friction energies all increase to keep E_{TOT} constant.

In Equation (1-159), the summations over the ij pairs exclude those ij pairs that are identified in the input as DRI elements. This is done because these ij beams and their masses are isolated from the rest of the system; the forces in DRI beam ij drive mass j but not mass i. Also, the summations in Equation (1-158) for the kinetic and potential energies exclude mass j in a DRI ij pair, since this mass is isolated from the system. Thus, if ij pairs 6-9 and 11-15 are defined as DRI elements, the summations for SE and DE will exclude these ij pairs and the summations for KE and PE will exclude masses 9 and 15.

The kinetic energy for each mass, including translational and rotational components, is simply

$$KE_i = \frac{1}{2} \{vel_i\}^T [M_i] \{vel_i\} \tag{1-161}$$

where

$$[M_i] = \begin{bmatrix} m_i & & & & & \\ & m_i & & & & \\ & & m_i & & & \\ & & & I_{xi} & I_{xyi} & I_{xzi} \\ & & & I_{xyi} & I_{yi} & I_{yzi} \\ & & & I_{xzi} & I_{yzi} & I_{zi} \end{bmatrix} \tag{1-162}$$

and

$$\{vel_i\} = \begin{Bmatrix} u_i \\ v_i \\ w_i \\ p_i \\ q_i \\ r_i \end{Bmatrix} \tag{1-163}$$

$[M_i]$ is the 6 x 6 inertia matrix for mass i, and $\{vel_i\}$ is a six-element vector of the linear and angular velocity components of mass i in body-fixed axes.

The ith mass potential energy, referenced to the ground plane, is given by

$$PE_i = -W_i \; z_i \tag{1-164}$$

Note that z_i is positive downward, measured from the ground plane.

The strain energy in internal beam ij is computed as a continuous summation of the incremental energy contributions from each integration interval.

$$\left(SE_{ij}\right)_{current} = \left(SE_{ij}\right)_{previous} + \sum_{\ell=1}^{6} \left(F'_{i\ell} dv_{i\ell} + F'_{j\ell} dv_{j\ell}\right) \tag{1-165}$$

$F'_{i\ell}\,dv_{i\ell}$ is the internal beam force (or moment) in the ℓ^{th} direction, multiplied by the incremental beam deflection (or rotation) in the ℓ^{th} direction at beam end iM. The corresponding j subscript terms apply to beam end jN. The sum of these constitute the incremental strain energy for the integration interval being considered. This straightforward formulation automatically accounts for the complexities of nonlinear, coupled deflections and unloading-reloading behavior, since these are considered in the calculation of $F'_{i\ell}$.

The damping energy dissipated in internal beam ij is computed in a similar manner:

$$\left(DE_{ij}\right)_{current} = \left(DE_{ij}\right)_{previous} + \sum_{\ell=1}^{6} \left(F'_{Di\ell}\,dv_{i\ell} + F'_{Dj\ell}\,dv_{j\ell}\right) \qquad (1\text{-}166)$$

$F'_{Di\ell}$ is the internal beam damping force (or moment) in the ℓ^{th} direction.

The crushing and friction energies are calculated as a summation of incremental energy changes. These are first expressed in terms of the total external spring forces acting on mass m_i, and the incremental displacements and rotations of m_i. These total forces are then broken down into the components from each individual external spring (ik pair), and further into the components resulting from spring loads normal to the surface (crushing energy) and those loads in the plane of the surface (friction energy).

First we write

$$\begin{Bmatrix} CE_i \\ + \\ FE_i \end{Bmatrix}_{current} = \begin{Bmatrix} CE_i \\ + \\ FE_i \end{Bmatrix}_{previous} - \left\lfloor XC_i,\ YC_i, \ldots, NC_i \right\rfloor \begin{Bmatrix} dx'_i \\ dy'_i \\ dz'_i \\ dpin_i \\ dqin_i \\ drin_i \end{Bmatrix} \qquad (1\text{-}167)$$

XC_i, YC_i, ..., NC_i are the six forces and moments acting on mass i in body-fixed axes, resulting from all ik external springs attached to mass i. These are given by Equation (1-110). The vector $\{dx'_i, dy'_i, dz'_i, dpin_i, dqin_i, drin_i\}$ is made up of the six incremental deflections and rotations of mass m_i, in the same body-fixed axes. The first three terms of this vector are given by a simple rotation transformation of the incremental deflections in ground axes, which are obtained directly fron numerical integration of the equations of motion.

$$\begin{Bmatrix} dx'_i \\ dy'_i \\ dz'_i \end{Bmatrix} = [A_i]^T \begin{Bmatrix} dx_i \\ dy_i \\ dz_i \end{Bmatrix} \qquad (1\text{-}168)$$

The last three terms of the incremental displacement vector in Equation (1-167) are the incremental changes in the integrals of the angular velocities of mass m_i, p_i, q_i, r_i. These are the incremental rotations of mass m_i in body-fixed axes for the integration interval being considered, given by Equation (1-12).

The negative sign in Equation (1-167) results from the fact that the forces acting on mass m_i rather than the forces within the ik springs are being considered. A positive deflection of spring ik results in a negative force on mass m_i. The energy calculated in Equation (1-167) includes the energy dissipated by the sliding of spring ik on the ground with a friction coefficient, since the forces in that equation include the ground drag loads due to friction.

Now separate out the contribution of each external spring (ik pair), by substituting Equations (1-109) and (1-110) for the $[XC_i, YC_i, ..., NC_i]$ in Equation (1-167). This reformulates Equation (1-167) into a function of the individual crash spring forces FSP_{ijk}, where i and k refer to the ik spring and

j refers to the direction of the forces on the ik spring. These forces are shown in Figure 1-13. The resulting equation for the crushing/friction energy associated with each spring ik is the following:

$$\begin{pmatrix} CE_{ik} \\ + \\ FE_{ik} \end{pmatrix}_{current} = \begin{pmatrix} CE_{ik} \\ + \\ FE_{ik} \end{pmatrix}_{previous} - \sum_{j=1}^{3} FSP_{ijk}\, d' vc_{ij} + TERM_{ik} \quad (1\text{-}169)$$

where

$$\left\{ d' vc_i \right\} = \begin{Bmatrix} dx'_i \\ dy'_i \\ dz'_i \end{Bmatrix} \quad (1\text{-}170)$$

and

$$TERM_{ik} = FSP_{i31} (\ell_{i1} + rx)\, dqin_i - FSP_{i21} (\ell_{i1} + rx)\, drin_i + FSP_{i11} (rydrin_i - rzdqin_i) + FSP_{i21} rzdpin_i - FSP_{i31} rydpin_i \qquad k = 1$$

$$TERM_{ik} = - FSP_{i32} (\ell_{i2} + ry)\, dpin_i + FSP_{i12} (\ell_{i2} + ry)\, drin_i - FSP_{i12}\, rzdqin_i + FSP_{i22} (rzdpin_i - rxdrin_i) + FSP_{i32} rxdqin_i \qquad k = 2$$

$$TERM_{ik} = FSP_{i23} (\ell_{i3} + rz)\, dpin_i - FSP_{i13} (\ell_{i3} + rz)\, dqin_i + FSP_{i13}\, rydrin_i - FSP_{i23}\, rxdrin_i + FSP_{i33} (rxdqin_i - rydpin_i) \qquad k = 3 \quad (1\text{-}171)$$

Finally, Equation (1-169) is further reduced by separating the individual spring forces FSP_{ijk} into the components due to friction and crushing. These are denoted by $FSPF_{ijk}$ and $FSPC_{ijk}$, respectively. These are calculated by using Equations (1-103) and (1-108), with $XVOC_{ijk}$ and $XVOCSL_{ijk}$ broken down further into crushing and friction components. This results in the following set of equations:

$$\left.\begin{array}{lll} \text{crushing} & \left\{XVOCC_{ik}\right\} = \begin{Bmatrix} 0 \\ 0 \\ XVOC_{i3k} \end{Bmatrix} & \\ \text{friction} & \left\{XVOCF_{ik}\right\} = \begin{Bmatrix} XVOC_{i1k} \\ XVOC_{i2k} \\ 0 \end{Bmatrix}, & \end{array}\right\} \text{Contact with Horizontal Ground}$$

$$\left.\begin{array}{lll} \text{crushing} & \left\{XVOCSLC_{ik}\right\} = \begin{Bmatrix} 0 \\ 0 \\ XVOCSL_{i3k} \end{Bmatrix} & \\ \text{friction} & \left\{XVOCSLF_{ik}\right\} = \begin{Bmatrix} XVOCSL_{i1k} \\ XVOCSL_{i2k} \\ 0 \end{Bmatrix} & \end{array}\right\} \text{Contact with Inclined Slope} \qquad (1\text{-}172)$$

$$\left.\begin{array}{ll} \text{crushing} & \left\{FSPC_{ik}\right\} = -\left[Ai\right]^T \left\{XVOCC_{ik}\right\} \\ \text{friction} & \left\{FSPF_{ik}\right\} = -\left[Ai\right]^T \left\{XVOCF_{ik}\right\} \end{array}\right\} \text{Contact with Horizontal Ground}$$

$$\left.\begin{array}{ll} \text{crushing} & \left\{FSPC_{ik}\right\} = -\left[Ai\right]^T \left[ABETA\right] \left\{XVOCSLC_{ik}\right\} \\ \text{friction} & \left\{FSPF_{ik}\right\} = -\left[Ai\right]^T \left[ABETA\right] \left\{XVOCSLF_{ik}\right\} \end{array}\right\} \text{Contact with Inclined Slope} \qquad (1\text{-}173)$$

$$(CE_{ik})\ \text{current} = (CE_{ik})\ \text{previous} - \sum_{j=1}^{3} FSPC_{ijk}\ d'vc_{ij} + TERMC_{ik}$$

$$(FE_{ik})\ \text{current} = (FE_{ik})\ \text{previous} - \sum_{j=1}^{3} FSPF_{ijk}\ d'vc_{ij} + TERMF_{ik} \qquad (1\text{-}174)$$

In Equations (1-174), $TERMC_{ik}$ and $TERMF_{ik}$ are evaluated using Equation (1-171) with the FSP's replaced by FSPC and FSPF as appropriate. Equations (1-174) give the crushing and friction energies for each spring (ik pair) used in equations (1-160) to calculate the total CE and FE.

1.3.17 Stress Equations

The program is coded so that internal beam elements can be analyzed for stresses and checked against two failure criteria. For each beam element, the location of the maximum bending moments in two planes is determined. This occurs at one end of the beam or the other, never in the middle. The program calculates the stress state of four plane elements located at the four sides of the beam; top, bottom, left and right. Axial stresses due to axial load and bending are computed. Shear stresses due to tension and lateral loads are also calculated. For each of the four plane elements of a given beam, the maximum shear stress and two principal stresses are then calculated. These are used to form ratios of actual stress/failure stress using two failure criteria; Maximum Shear Stress Theory and the Theory of Constant Energy of Distortion. The stress calculations in no way alter the scheme for computing internal beam loads discussed in Section 1.3.5.3. They are an additional calculation to provide the program user with a measure of the stress state for the beam elements.

Figure 1-22 illustrates a typical plane element as viewed from the top (for the top and bottom elements) or from the left side (for the left and right side elements).

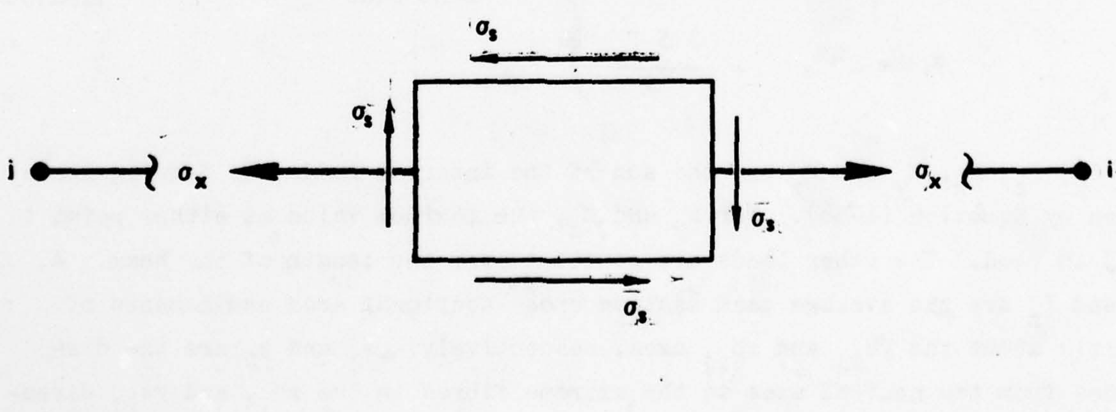


Figure 1-22. Stress Element

For the top and bottom elements, Figure 1-22 is looking in the direction of the positive zb_{ij} beam axis; for the left and right side elements in the direction of the positive yb_{ij} axis. The positive sign conventions for axial stress σ_x and shear stress σ_s are shown.

The axial and shear stresses are calculated as follows:

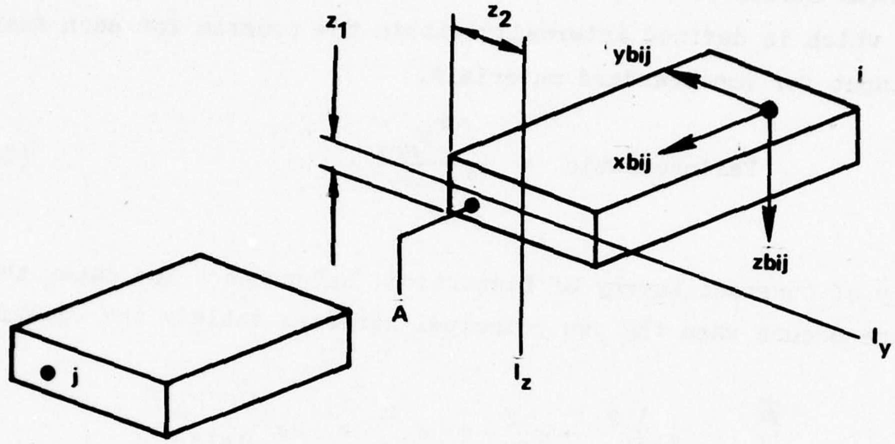
$$\left.\begin{aligned} \sigma_x &= \frac{F_x}{A} - \frac{M_y z_1}{I_y} \\ \sigma_s &= QM_x + \frac{1.5\,F_y}{A} \end{aligned}\right\} \quad \text{Top} \qquad (1\text{-}175a)$$

$$\left.\begin{aligned} \sigma_x &= \frac{F_x}{A} + \frac{M_y z_1}{I_y} \\ \sigma_s &= -QM_x + \frac{1.5\,F_y}{A} \end{aligned}\right\} \quad \text{Bottom} \qquad (1\text{-}175b)$$

$$\left.\begin{aligned} \sigma_x &= \frac{F_x}{A} + \frac{M_z z_2}{I_z} \\ \sigma_s &= QM_x - \frac{1.5\,F_z}{A} \end{aligned}\right\} \quad \text{Left Side} \qquad (1\text{-}175c)$$

$$\left.\begin{aligned} \sigma_x &= \frac{F_x}{A} - \frac{M_z z_2}{I_z} \\ \sigma_s &= -QM_x - \frac{1.5\,F_z}{A} \end{aligned}\right\} \quad \text{Right Side} \qquad (1\text{-}175d)$$

F_x, F_y, F_z, M_x, M_y and M_z are the sum of the internal loads and damping loads given by Equation (1-58). For M_y and M_z, the maximum value at either point i or j is used. The other loads are constant over the length of the beam. A, I_y and I_z are the average beam section cross-sectional area and moments of inertia about the yb_{ij} and zb_{ij} axes, respectively. z_1 and z_2 are the distances from the neutral axes to the extreme fibres in the zb_{ij} and yb_{ij} directions, respectively. These are illustrated in the following sketch:



Q is a sectional shape factor relating the torsional shear stress to the applied moment. Reference 4, Table IX contains formulae for 1/Q for a variety of commonly encountered structural cross sections. The 1.5 factor for the direct shear contributions in Equations (1-175) results from the non-uniform distribution of the shear stress across the section. The peak value at the center is used.

After the axial stress σ_x and shear stress σ_s are calculated for each of the four locations, the maximum shear stress $\sigma_{s_{max}}$ and the principal stresses σ_1 and σ_2 are calculated. Reference 4, Table II, gives the following equations:

$$\sigma_{s_{max}} = \sqrt{\left(\frac{1}{2}\sigma_x\right)^2 + \sigma_s^2} \qquad (1\text{-}176a)$$

$$\sigma_1, \sigma_2 = \frac{1}{2}\sigma_x \pm \sigma_{s_{max}} \qquad (1\text{-}176b)$$

These stresses are used to calculate "failure ratios," which are the ratios of the current stress to the failures stress, for each of the four locations. The failure ratios are calculated for two failure theories; Maximum Shear Stress Theory and Theory of Constant Energy of Distortion. For the former, the maximum shear stress from equation (1-176) is divided by the allowable shear stress, which is defined internally within the program for each standard material or input for non-standard materials.

$$\text{Failure Ratio} = \frac{\sigma_{s_{max}}}{\sigma_{shear}} \tag{1-177}$$

For the Theory of Constant Energy of Distortion, Reference 4 indicates that elastic failure occurs when the two principal stresses satisfy the equation

$$(\sigma_1 - \sigma_2)^2 + \sigma_2^2 + \sigma_1^2 = 2\sigma_{yield}^2$$

This reduces to

$$\sigma_1^2 - \sigma_1 \sigma_2 + \sigma_2^2 = \sigma_{yield}^2 \tag{1-178}$$

The program calculates a reference principal stress defined as

$$\sigma_p = \sqrt{\sigma_1^2 - \sigma_1 \sigma_2 + \sigma_2^2}$$

This is then divided by σ_{yield} to form a Failure Ratio for the Theory of Constant Energy Distortion:

$$\text{Failure Ratio} = \frac{\sigma_p}{\sigma_{yield}} \tag{1-179}$$

Both Failure Ratios from equations (1-177) and (1-179) are printed out at each print time interval, for each of the four plane element locations for each internal beam.

SECTION 2

PROGRAM CONTROLS

2.1 GENERAL

This section contains a brief description of

- The symbols which control the input-output capabilities of KRASH,
- the program subroutines,
- a comprehensive program listing

A User's Guide which completely defines the input-output requirements is provided in Volume 2, Section 2.

2.2 CONTROL PARAMETERS

Tables 2-1 through 2-4 list the various input/output control parameters which are used extensively in KRASH. Table 2-1 presents the program sizing constants, and shows the maximum allowable sizes for the different types of data. Table 2-2 defines the program execution modes. Tables 2-3 and 2-4 define the print output and plot output options, respectively. Table 2-5 and Figure 2-1 list the subroutines used in KRASH and provide a brief outline of the program flow. A Programmer's Manual (Reference 7) contains detailed programming data.

TABLE 2-1. PROGRAM SIZING CONSTANTS

CONSTANT	MAXIMUM VALUE	DESCRIPTION
NM	80	Number of masses
NSP	40	Number of external springs
NB	100	Number of internal beams
NLB	120	Number of nonlinear beam-direction combinations (KR Tables)
NHI	80	Number of masses having non-zero He_{x_i}, He_{y_i}, He_{z_i}, I_{xy_i}, I_{yz_i}, or ℓc_i
MVP	-	Reference mass number for volume penetration calculations
NVCH	5	Number of volumes for occupiable volume change calculations
NDRI	100	Number of DRI beam elements
NMTL	5	Number of non-standard beam materials
NACC	50	Number of input acceleration time-history tables
NVBM	100	Number of internal beams having non-standard maximum deflections for beam rupture. Standard Value = 100 (inches of deflection and radians of rotation)
NFBM	100	Number of internal beams having non-standard maximum forces for beam rupture. Standard Value = 1E10
NPH	80	Number of masses having non-zero Euler angles ϕ_i'', θ_i'', ψ_i''
ND	100	Number of internal beams having damping ratios different from that specified on card 0900
NKM	100	Number of internal beams for which the full 6 x 6 stiffness matrix is directly input
NPIN	100	Number of internal beams having other than fixed-fixed end conditions
NNP	50	Number of node points
NUB	100	Number of unsymmetrical beams

TABLE 2-2. PROGRAM EXECUTION MODES

RUNMOD	INPUT DATA SET	DATA SET ANALYZED	AIRPLANE MODEL	IMPACT CONDITIONS
0	Full Airplane	Full Airplane	Unsymmetrical	Unsymmetrical
1	Half Airplane	Half Airplane	Symmetrical	Symmetrical
2	Half Airplane	Full Airplane	Symmetrical	Unsymmetrical

TABLE 2-3. PRINT OUTPUT OPTIONS

INPUT CONSTANT	CORRESPONDING PRINT DATA
NSF	Beam strain forces
NTF	Beam total forces (strain and damping)
NDE	Beam deflections
NSPD	External spring loads and deflections
NED	Energy breakdown by mass, beam and spring
NS	Beam stresses
NRP	Mass displacement, velocity and acceleration data

TABLE 2-4. PLOT OUTPUT PARAMETERS

INPUT CONSTANT	CORRESPONDING PLOT CONTROL
NMEP	Number of mass points to be plotted
NNEP	Number of node points to be plotted
NBFP	Number of beams having force/moment plots
NBDP	Number of beams having deflection/rotation plots
NSTP	Number of beams having stress plots
NSEP	Number of masses having external spring force/deflection plots
NDRP	Number of DRI masses for plotting

TABLE 2-5. PROGRAM KRASH SUBROUTINES

SUBROUTINE NAME	FUNCTION
MAIN	Controls overall program execution, numerical integration
ECHO	Prints out listing of input data cards
INPUT	Reads input data
GENMOD	Generates full airplane input data set from half airplane input data
INPRNT	Prints out input data
IC	Calculates initial conditions
DOAIJ	Calculates internal beam frequencies and damping constants
DERIV	Calculates accelerations of masses
CFORCE	Calculates external spring forces
PRINT	Prints output data and stores data for plots
RC	Initial conditions used with restart case
RSIN	Reads initial conditions off tape from previous case for restart case
RSOUT	Writes current conditions onto tape for future restart usage
PREPLT	Reads and orders plot data
PLOTT	Prints data in special plot format
DATIN	Performs actual tape read, called from RSIN
DATOUT	Performs actual tape write, called from RSOUT
ACCELT	Calculates specified mass accelerations from input data
INTERP	Interpolation subroutine used in ACCELT
EULER	Calculates 3 x 3 rotation transformation on matrix given 3 Euler angles
MATMUL	Multiplies two 3 x 3 matrices
MATVEC	Multiplies a 3 x 3 matrix times a 3 x 1 vector

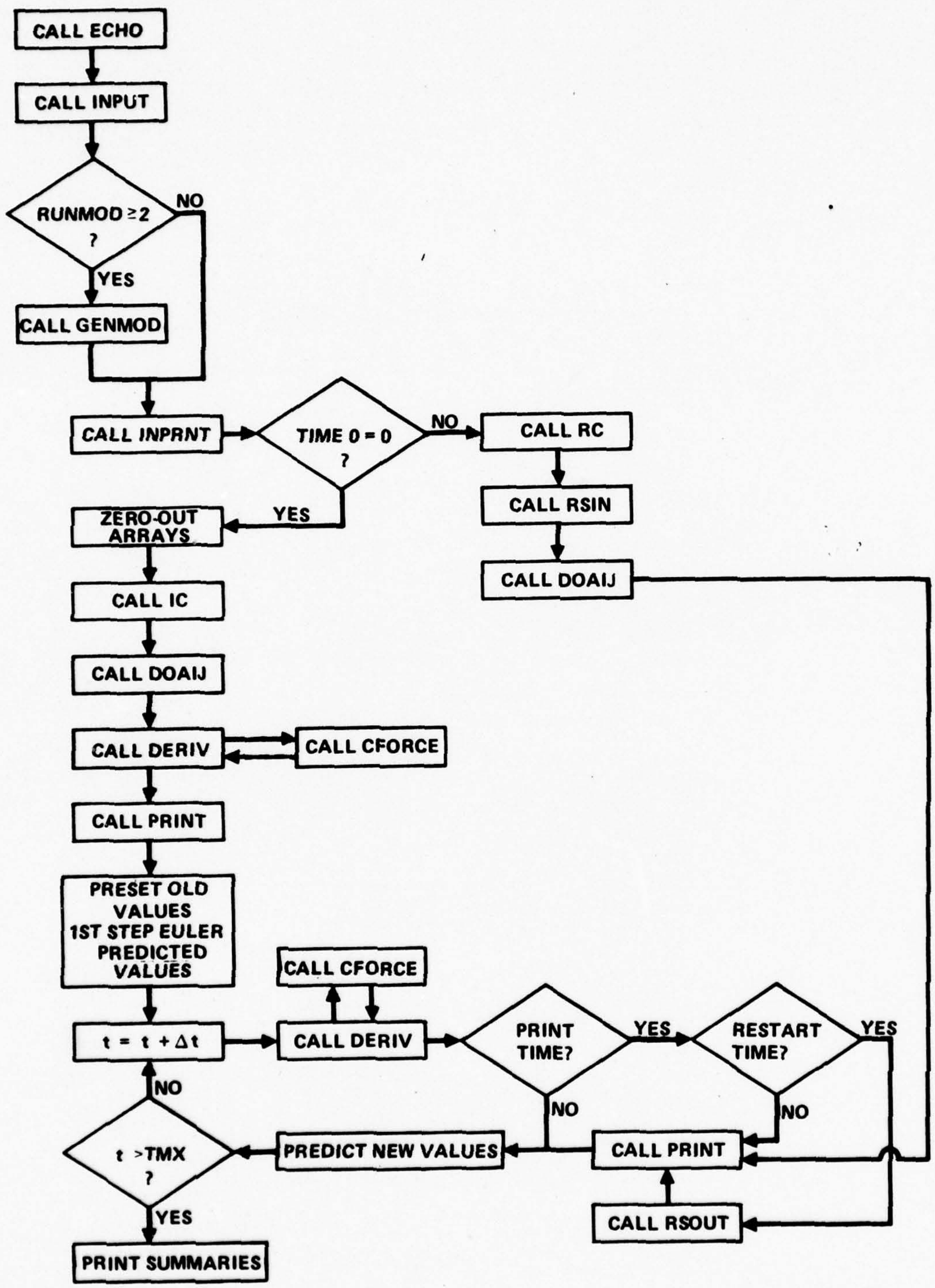


Figure 2-1. KRASH Flow Chart

AD-A055898

ERRATA SHEET

Report No. FAA-RD-77-189, I

PROGRAM "KRASH" THEORY

1. Delete complete Appendix A, Program Listing, and replace with enclosed Appendix A (Revised), Program Listing, pages A-2 through A-202.

2. The enclosed change (yellow sheet) to the listing, Subroutine 'INPUT', is necessary if it is desired to model more than one oleo strut. Refer to Page A-130.

Released September 28, 1979

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APPENDIX A (REVISED)

PROGRAM LISTING

LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.

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COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                   SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
          C          DATA SET D2334SS    AT LEVEL 001 AS OF 06/26/79
          C          DATA SET D2334MAIN  AT LEVEL 011 AS OF 06/25/79
          C          DATA SET D2332GMN   AT LEVEL 002 AS OF 05/02/78
          C          DATA SET D2332FMN   AT LEVEL 002 AS OF 02/09/78
          C
ISN 0002             IMPLICIT REAL*8 (A-H,O-Z)
ISN 0003             REAL*8 KUN, CASEIN, CASOUT, MINDT
ISN 0004             REAL*4 ENGSMY(6,200),PERCNT(6),ETIME(200)
ISN 0005             INTEGER*4 TITLE(40),STOP,RUNIN,RUNOUT,BPL(100,3)
ISN 0006             INTEGER*2 N1,N3,IJPR,NN,IBS,JBS,IG,JG,IEER,IESE,IEPSE,IEDE,IEPDE
ISN 0007             INTEGER*2 IECE,IEPCE,IEFE,IEPFE,IEDEV,IETOT
ISN 0008             INTEGER*2 MG(150),NG(150),INP(50),MNP(50)
ISN 0009             INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)
ISN 0010             INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                    *         JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),
                    *         JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),
                    *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0011             DIMENSION DEV(200)
ISN 0012             DIMENSION N3(150,6),
                    1 VEE2(6,150)
ISN 0013             COMMON/INPR/ NDRI,NSP
ISN 0014             COMMON/MADE/KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,
                    1 TPL(100),BPL,KPL
ISN 0015             COMMON/MACF/ IBS(40),FSPOP(40),SCP(40), JBS(40),
                    1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                    2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0016             COMMON/MACFIN/ TMAX,IPRINT
ISN 0017             COMMON/MAPR/ ETOTTO,ENGSMY,INGSCT
ISN 0018             COMMON/MAPR1/ DEV,ETIME,IEER,IESE,IEPSE,IEDE,IEPDE,IECE,IEPCE,
                    1 IEFE,IEPFE,IEDEV,IETOT
ISN 0019             COMMON/NP00I4/ NNP
ISN 0020             COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0021             COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),
                    1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                    2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                    3 YIMNPL(50),ZIMNPL(50)
ISN 0022             COMMON                   XX(80),XY(80),XZ(80),XL(80),XM(80),
                    1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),
                    2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),
                    5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),
                    6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),
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               7 PHIOLD(80),THEOLD(80),PSIOLD(80),                              00000400
               8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80), 00000410
               9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50), 00000420
               A TKR(200),TPEN(80),DTHALF,                                       00000430
               B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT                  00000440
ISN 0023         COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                              00000450
ISN 0024         COMMON/MCFIII/ SYMFLG                                           00000460
ISN 0025         COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000470
               1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),           00000480
               2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),          00000490
               3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),   00000500
               4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80), 00000510
               5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT, 00000520
               6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                            00000530
               7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,            00000540
               8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),          00000550
               9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),        00000560
               A CEIKF(40),                                                      00000570
               B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                           00000580
               C NM,NB,I,J,IG(150),JG(150),                                      00000590
               D N1(900),NN(40),IJPR(150)                                        00000600
ISN 0026         COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,          00000610
               *              JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,         00000620
               *              NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT     00000630
ISN 0027         COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)     00000640
ISN 0028         COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR   00000650
ISN 0029         EQUIVALENCE (N1(1),N3(1)),(VEE(1),VEE2(1))                      00000660
ISN 0030         DATA STOP/'END '/                                               00000670
ISN 0031         MAXNM = 80                                                      00000680
ISN 0032         IPC = 0                                                         00000690
ISN 0033         MAXIGS = 150                                                    00000700
ISN 0034         MAXTBL = 180                                                    00000710
ISN 0035         CALL ECHO                                                       00000720
ISN 0036         CALL ECHO                                                       00000730
ISN 0037       1 CALL INPUT                                                      00000740
ISN 0038         IF(TITLE(1).EQ.STOP) GO TO 1000                                 00000750
ISN 0040         IF(DELTAT.LE.0.) GO TO 1000                                     00000760
ISN 0042         IF(NM.LE.0) GO TO 1000                                          00000770
            C                                                                    00000780
            C    THE INPUT PARAMETER RUNMOD CONTROLS THE TYPE OF CASE TO BE RUN  00000790
            C    ACCORDING TO THE FOLLOWING OPTIONS:                             00000800
            C                                                                    00000810
            C                                                                    00000820
            C    RUNMOD              DESCRIPTION                                 00000830
            C                                                                    00000840
            C      0.       INPUT FULL AIRPLANE DATA SET,STANDARD EXECUTION      00000850
            C                                                                    00000860
            C      1.       INPUT 1/2 AIRPLANE DATA SET,SYMMETRICAL IMPACT       00000870
            C                                                                    00000880
            C      2.       INPUT 1/2 AIRPLANE DATA SET AND THE PROGRAM WILL     00000890
            C               GENERATE AND PRINT THE FULL SYMMETRICAL DATA SET     00000900
            C                                                                    00000910
            C      3.       SAME AS 2 WITH COMPLETE DATA SET PUNCH               00000920
```

A-3

```
                C
                C       4.      SAME AS 2 ONLY INCLUDE SYMMETRICAL CONSTRAINTS IN DE.
                C
                C
                C     REWIND NECESSARY UNITS IF PLOTS ARE REQUESTED
                C
ISN 0044              IF(NMEP .GT. 0) REWIND 1
ISN 0046              IF(NNEP .GT. 0) REWIND 2
ISN 0048              IF(NBFP .GT. 0) REWIND 3
ISN 0050              IF(NBDP .GT. 0) REWIND 4
ISN 0052              IF(NSEP .GT. 0) REWIND 8
ISN 0054              IF(NDRP .GT. 0) REWIND 9
ISN 0056              IF(NENP.GT.0) REWIND 11
ISN 0058              REWIND 10
ISN 0059              IF(NSTP .GT. 0) REWIND 13
                C
                C     SET PLOT COUNTERS TO ZERO
                C
ISN 0061              NMEW = 0
ISN 0062              NNEW = 0
ISN 0063              NBFW = 0
ISN 0064              NBDW = 0
ISN 0065              NSEW = 0
ISN 0066              NDRW = 0
ISN 0067              NSTW = 0
ISN 0068              NENW=0
ISN 0069              NPRINT = 0
                C
                C     SET ENERGY ERROR MESSAGE INDICES TO ZERO
                C
ISN 0070              IEER=0
ISN 0071              IETOT=0
ISN 0072              IESE=0
ISN 0073              IEPSE=0
ISN 0074              IEDE=0
ISN 0075              IEPDE=0
ISN 0076              IECE=0
ISN 0077              IEPCE=0
ISN 0078              IEFE=0
ISN 0079              IEPFE=0
ISN 0080              IEDEV=0
ISN 0081              SYMFLG = 0.
ISN 0082              PUNMOD = 0.
ISN 0083              IF(RUNMOD.EQ.1.) SYMFLG = 1.
ISN 0085              IF(RUNMOD.EQ.3.) PUNMOD = 1.
ISN 0087              IF(RUNMOD.EQ.4.) SYMFLG = 2.
ISN 0089              IF(RUNMOD.GE.2.) CALL GENMOD
ISN 0091              CALL INPRNT
ISN 0092              DT2 = 2.0*DELTAT
ISN 0093              DTHALF = .5*DELTAT
ISN 0094              DO 130 I = 1,NM
ISN 0095                XI1(I) = YI(I)*ZI(I)-YZI(I)*YZI(I)
ISN 0096                XI2(I) = XYI(I)*ZI(I)+XZI(I)*YZI(I)
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```
ISN 0097           XI3(I) = XYI(I)*YZI(I)+YI(I)*XZI(I)                       00001460
ISN 0098           XI4(I) = XI(I)*YZI(I)+XZI(I)*XYI(I)                       00001470
ISN 0099           XI5(I) = XI(I)*ZI(I)-XZI(I)*XZI(I)                        00001480
ISN 0100           XI6(I) = XI(I)*YI(I)-XYI(I)*XYI(I)                        00001490
ISN 0101       130 DELI(I) = 1.0/(XI(I)*XI1(I)-XYI(I)*XI2(I)-XZI(I)*XI3(I))  00001500
ISN 0102           DO 154 I=1,200                                            00001510
            C      COUNTERS FOR RUPTURE AND YIELD SUMMARY ARE SET TO ZERO    00001520
ISN 0103           TKR(I)=0.                                                 00001530
ISN 0104           DO 154 J=1,4                                              00001540
ISN 0105           KRBEAM(J,I)=0.                                            00001550
ISN 0106       154 CONTINUE                                                  00001560
ISN 0107           DO 155 I=1,200                                            00001570
ISN 0108           TSP(I)=0.                                                 00001580
ISN 0109           DO 155 J=1,5                                              00001590
ISN 0110           EXSP(J,I)=0.                                              00001600
ISN 0111           KKSP(J,I)=0.                                              00001610
ISN 0112       155 CONTINUE                                                  00001620
ISN 0113           IF (RUNIN .EQ. 0) GO TO 5                                 00001630
ISN 0115             CALL RC                                                 00001640
ISN 0116             CALL RSIN(CASEIN,RUNIN,MSECIN)                          00001650
ISN 0117             PRINT 5000,CASEIN,RUNIN,MSECIN                          00001660
ISN 0118             CALL DOAIJ                                              00001670
ISN 0119             INGOLD = INGSCT                                         00001680
ISN 0120             GO TO 270                                               00001690
ISN 0121         5 CONTINUE                                                  00001700
ISN 0122      5000 FORMAT(1H0,2X,'****DATA MANAGEMENT RESTART ROUTINES INVOKED****' 00001710
                 1 / 10X,'REQUESTED CASE TITLE   - ',A8                      00001720
                 2 / 10X,'REQUESTED RUN NUMBER   - ',I10                     00001730
                 3 / 10X,'REQUESTED RESTART TIME - ',I10 / 1H0)              00001740
ISN 0123           INGSCT = 0                                                00001750
ISN 0124           INGOLD = 0                                                00001760
ISN 0125           KRCONT = 0                                                00001770
ISN 0126           KPEN=0                                                    00001780
ISN 0127           KKONT=0                                                   00001790
ISN 0128           KPL=0                                                     00001800
            C (26)                                                           00001810
            C ZERO ARRAYS                                                    00001820
ISN 0129           TIME = 0.0                                                00001830
ISN 0130           NM9 = 9*NM                                                00001840
ISN 0131           DO 140 I = 1,NM9                                          00001850
ISN 0132       140 BIJ(I) = 0.0                                              00001860
ISN 0133           DO 150 I = 1,NM                                           00001870
ISN 0134           DX(I) = 0.0                                               00001880
ISN 0135           DY(I) = 0.0                                               00001890
ISN 0136           DZ(I) = 0.0                                               00001900
ISN 0137           XX(I) = 0.0                                               00001910
ISN 0138           XY(I) = 0.0                                               00001920
ISN 0139           XZ(I) = 0.0                                               00001930
ISN 0140           XL(I) = 0.0                                               00001940
ISN 0141           XM(I) = 0.0                                               00001950
ISN 0142           XN(I) = 0.0                                               00001960
ISN 0143           XIMP(I)=0.                                                00001970
ISN 0144           YIMP(I)=0.                                                00001980
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ISN 0145           ZIMP(I)=0.                                                      00001990
ISN 0146           DPX(I) = 0.0                                                    00002000
ISN 0147           DPY(I) = 0.0                                                    00002010
ISN 0148           DPZ(I) = 0.0                                                    00002020
ISN 0149           DPL(I) = 0.0                                                    00002030
ISN 0150           DPM(I) = 0.0                                                    00002040
ISN 0151           DPN(I) = 0.0                                                    00002050
ISN 0152           DPIN(I) = 0.0                                                   00002060
ISN 0153           DQIN(I) = 0.0                                                   00002070
ISN 0154           DRIN(I) = 0.0                                                   00002080
ISN 0155           XACC(I)=0.0                                                     00002090
ISN 0156           YACC(I)=0.0                                                     00002100
ISN 0157           ZACC(I)=0.0                                                     00002110
ISN 0158       150 CONTINUE                                                        00002120
ISN 0159           DO 156 I=1,600                                                  00002130
ISN 0160           KRFLAG(I)=0                                                     00002140
ISN 0161       156 CONTINUE                                                        00002150
ISN 0162           DO 157 I=1,NNP                                                  00002160
ISN 0163           XIMPNP(I)=0.                                                    00002170
ISN 0164           YIMPNP(I)=0.                                                    00002180
ISN 0165           ZIMPNP(I)=0.                                                    00002190
ISN 0166       802 FORMAT(/1X,'MAIN',4E15.6)                                       00002200
ISN 0167       157 CONTINUE                                                        00002210
ISN 0168           DO 152 IKM=1,NSP                                                00002220
ISN 0169           IBS(IKM) = 0                                                    00002230
ISN 0170           NN(IKM) = 0                                                     00002240
ISN 0171           SC(IKM) = 0.0                                                   00002250
ISN 0172           CEIK(IKM) = 0.0                                                 00002260
ISN 0173           CEIKF(IKM) = 0.                                                 00002270
ISN 0174           SBAR(IKM) = 0.                                                  00002280
ISN 0175           KUN(IKM) = 0.                                                   00002290
ISN 0176           FSPBAR(IKM) = 0.0                                               00002300
             C      EXTERNAL SPRING SUMMARY TERMS 3/79                             00002310
ISN 0177           FSPOP(IKM)=0.                                                   00002320
ISN 0178           SCP(IKM)=0.                                                     00002330
ISN 0179           JBS(IKM)=0                                                      00002340
ISN 0180           STEMP1(IKM)=0.                                                  00002350
ISN 0181           STEMP2(IKM)=0.                                                  00002360
ISN 0182           STEMP3(IKM)=0.                                                  00002370
ISN 0183           STEMP4(IKM)=0.                                                  00002380
ISN 0184           STEMP5(IKM)=0.                                                  00002390
ISN 0185       152 CONTINUE                                                        00002400
ISN 0186           DO 160 IJ = 1,NB                                                00002410
ISN 0187           SEIJ(IJ) = 0.0                                                  00002420
ISN 0188           DEIJ(IJ) = 0.0                                                  00002430
ISN 0189           KFL26(IJ) = 0                                                   00002440
ISN 0190           KFL35(IJ) = 0                                                   00002450
ISN 0191           FL26I(IJ)=0                                                     00002460
ISN 0192           FL26J(IJ)=0                                                     00002470
ISN 0193           FL35I(IJ)=0                                                     00002480
ISN 0194           FL35J(IJ)=0                                                     00002490
ISN 0195           DO 160 L = 1,6                                                  00002500
ISN 0196           SUMDF(L,IJ) = 0.0                                               00002510
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ISN 0197          N3(IJ,L) = 0
ISN 0198      160 VEE2(L,IJ) = 0.0
ISN 0199          DO 165 J = 1,3
ISN 0200          DO 165 K = 1,3
ISN 0201      165 VEEDOT(J,K) = 0.0
              C DO INITIAL CONDITIONS
ISN 0202          CALL IC
              C DO ALL THE (AIJ) INTO DIJ
ISN 0203          CALL DOAIJ
ISN 0204          CALL DERIV
ISN 0205          CALL PRINT
ISN 0206          NPRINT = 1
ISN 0207          IPC = 0
ISN 0208          DO 200 I = 1,NM
              C PRESET OLD VALUES
ISN 0209          PINO(I) = 0.0
ISN 0210          QINO(I) = 0.0
ISN 0211          RINO(I) = 0.0
ISN 0212          XOLD(I) = X(I)
ISN 0213          YOLD(I) = Y(I)
ISN 0214          ZOLD(I) = Z(I)
ISN 0215          PHIOLD(I) = PHI(I)
ISN 0216          THEOLD(I) = THETA(I)
ISN 0217          PSIOLD(I) = PSI(I)
ISN 0218          POLD(I) = P(I)
ISN 0219          QOLD(I) = Q(I)
ISN 0220          ROLD(I) = R(I)
ISN 0221          UOLD(I) = U(I)
ISN 0222          VOLD(I) = V(I)
ISN 0223          WOLD(I) = W(I)
ISN 0224          XAFOLD(I)=XACF(I)
ISN 0225          YAFOLD(I)=YACF(I)
ISN 0226          ZAFOLD(I)=ZACF(I)
ISN 0227          XIMPOL(I)=XIMP(I)
ISN 0228          YIMPOL(I)=YIMP(I)
ISN 0229          ZIMPOL(I)=ZIMP(I)
              C DO 1ST STEP EULER
ISN 0230          DPIN(I) = DELTAT*P(I)
ISN 0231          DQIN(I) = DELTAT*Q(I)
ISN 0232          DRIN(I) = DELTAT*R(I)
ISN 0233          PIN(I) = DPIN(I)
ISN 0234          QIN(I) = DQIN(I)
ISN 0235          RIN(I) = DRIN(I)
ISN 0236          P(I) = P(I)+DELTAT*PDOT(I)
ISN 0237          Q(I) = Q(I)+DELTAT*QDOT(I)
ISN 0238          R(I) = R(I)+DELTAT*RDOT(I)
ISN 0239          U(I) = U(I)+DELTAT*UDOT(I)
ISN 0240          V(I) = V(I)+DELTAT*VDOT(I)
ISN 0241          W(I) = W(I)+DELTAT*WDOT(I)
ISN 0242          XACF(I)=XACF(I)+DELTAT*XACFD(I)
ISN 0243          YACF(I)=YACF(I)+DELTAT*YACFD(I)
ISN 0244          ZACF(I)=ZACF(I)+DELTAT*ZACFD(I)
ISN 0245          XIMP(I)=XIMP(I)+DELTAT*XACF(I)
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ISN 0246          YIMP(I)=YIMP(I)+DELTAT*YACF(I)
ISN 0247          ZIMP(I)=ZIMP(I)+DELTAT*ZACF(I)
ISN 0248          DX(I) = DELTAT*XDOT(I)
ISN 0249          X(I) = X(I)+DX(I)
ISN 0250          DY(I) = DELTAT*YDOT(I)
ISN 0251          Y(I) = Y(I)+DY(I)
ISN 0252          DZ(I) = DELTAT*ZDOT(I)
ISN 0253          Z(I) = Z(I)+DZ(I)
ISN 0254          PHI(I) = PHI(I) + DELTAT*PHIDOT(I)
ISN 0255          THETA(I) = THETA(I) + DELTAT*THEDOT(I)
ISN 0256          PSI(I) = PSI(I) + DELTAT*PSIDOT(I)
ISN 0257      200 CONTINUE
ISN 0258          IF(NNP.EQ.0) GO TO 190
ISN 0260          DO 210 J=1,NNP
ISN 0261          XANPFO(J)=XACNPF(J)
ISN 0262          YANPFO(J)=YACNPF(J)
ISN 0263          ZANPFO(J)=ZACNPF(J)
ISN 0264          XIMNPL(J)=XIMPNP(J)
ISN 0265          YIMNPL(J)=YIMPNP(J)
ISN 0266          ZIMNPL(J)=ZIMPNP(J)
ISN 0267          XACNPF(J)=XACNPF(J)+DELTAT*XNPFD(J)
ISN 0268          YACNPF(J)=YACNPF(J)+DELTAT*YNPFD(J)
ISN 0269          ZACNPF(J)=ZACNPF(J)+DELTAT*ZNPFD(J)
ISN 0270          XIMPNP(J)=XIMPNP(J)+DELTAT*XACNPF(J)
ISN 0271          YIMPNP(J)=YIMPNP(J)+DELTAT*YACNPF(J)
ISN 0272          ZIMPNP(J)=ZIMPNP(J)+DELTAT*ZACNPF(J)
ISN 0273      210 CONTINUE
ISN 0274      190 TIME = TIME+DT2-DELTAT
ISN 0275          IPC = IPC+1
ISN 0276          CALL DERIV
ISN 0277          IF(IPC-IPRINT) 310,260,260
ISN 0278      260 ITIME = TIME*1000 + .5
ISN 0279          IF (MSCOUT(1).LE.0 .OR. MSCOUT(1).GT.ITIME) GO TO 270
ISN 0281            CALL RSOUT(CASOUT,RUNOUT,ITIME)
ISN 0282            PRINT 4000,MSCOUT(1),ITIME,TIME,CASOUT,RUNOUT
ISN 0283            DO 265 I1=1,4
ISN 0284      265     MSCOUT(I1) = MSCOUT(I1+1)
ISN 0285          MSCOUT(5) = 0
ISN 0286     4000 FORMAT(1H0,2X,'***DATA MANAGEMENT CHECKPOINT ROUTINES INVOKED***'
                1  / 10X,'REQUESTED TIME - ',I10      / 10X,'   ACTUAL TIME - ',I10
                2  / 10X,'    REAL TIME - ',1PE10.4 / 10X,'    CASE TITLE - ',A8
                3  / 10X,'        RUN NO. - ',I10 / 1H0)
ISN 0287      270 CALL PRINT
ISN 0288          NPRINT = 1
ISN 0289          IPC = 0
ISN 0290      310 CONTINUE
            C PREDICT, MOVE DOWN, AND DO DELTA'S
ISN 0291      280 DO 300 I = 1,NM
ISN 0292          T = PINO(I)+DT2*P(I)
ISN 0293          PINO(I) = PIN(I)
ISN 0294          PIN(I) = T
ISN 0295          DPIN(I) = PIN(I)-PINO(I)
ISN 0296          T = QINO(I)+DT2*Q(I)
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ISN 0297       QINO(I) = QIN(I)                                    00003580
ISN 0298       QIN(I) = T                                          00003590
ISN 0299       DQIN(I) = QIN(I)-QINO(I)                            00003600
ISN 0300       T = RINO(I)+DT2*R(I)                                00003610
ISN 0301       RINO(I) = RIN(I)                                    00003620
ISN 0302       RIN(I) = T                                          00003630
ISN 0303       DRIN(I) = RIN(I)-RINO(I)                            00003640
ISN 0304       T = XOLD(I)+DT2*XDOT(I)                             00003650
ISN 0305       XOLD(I) = X(I)                                      00003660
ISN 0306       X(I) = T                                            00003670
ISN 0307       DX(I) = X(I)-XOLD(I)                                00003680
ISN 0308       T = YOLD(I)+DT2*YDOT(I)                             00003690
ISN 0309       YOLD(I) = Y(I)                                      00003700
ISN 0310       Y(I) = T                                            00003710
ISN 0311       DY(I) = Y(I)-YOLD(I)                                00003720
ISN 0312       T = ZOLD(I)+DT2*ZDOT(I)                             00003730
ISN 0313       ZOLD(I) = Z(I)                                      00003740
ISN 0314       Z(I) = T                                            00003750
ISN 0315       DZ(I) = Z(I)-ZOLD(I)                                00003760
ISN 0316       T = PHIOLD(I)+DT2*PHIDOT(I)                         00003770
ISN 0317       PHIOLD(I) = PHI(I)                                  00003780
ISN 0318       PHI(I) = T                                          00003790
ISN 0319       T = THEOLD(I)+DT2*THEDOT(I)                         00003800
ISN 0320       THEOLD(I) = THETA(I)                                00003810
ISN 0321       THETA(I) = T                                        00003820
ISN 0322       T = PSIOLD(I)+DT2*PSIDOT(I)                         00003830
ISN 0323       PSIOLD(I) = PSI(I)                                  00003840
ISN 0324       PSI(I) = T                                          00003850
ISN 0325       T = POLD(I)+DT2*PDOT(I)                             00003860
ISN 0326       POLD(I) = P(I)                                      00003870
ISN 0327       P(I) = T                                            00003880
ISN 0328       T = QOLD(I)+DT2*QDOT(I)                             00003890
ISN 0329       QOLD(I) = Q(I)                                      00003900
ISN 0330       Q(I) = T                                            00003910
ISN 0331       T = ROLD(I)+DT2*RDOT(I)                             00003920
ISN 0332       ROLD(I) = R(I)                                      00003930
ISN 0333       R(I) = T                                            00003940
ISN 0334       T = UOLD(I)+DT2*UDOT(I)                             00003950
ISN 0335       UOLD(I) = U(I)                                      00003960
ISN 0336       U(I) = T                                            00003970
ISN 0337       T = VOLD(I)+DT2*VDOT(I)                             00003980
ISN 0338       VOLD(I) = V(I)                                      00003990
ISN 0339       V(I) = T                                            00004000
ISN 0340       T = WOLD(I)+DT2*WDOT(I)                             00004010
ISN 0341       WOLD(I) = W(I)                                      00004020
ISN 0342       W(I) = T                                            00004030
ISN 0343       T=XAFOLD(I)+DT2*XACFD(I)                            00004040
ISN 0344       XAFOLD(I)=XACF(I)                                   00004050
ISN 0345       XACF(I)=T                                           00004060
ISN 0346       T=XIMPOL(I)+DT2*XACF(I)                             00004070
ISN 0347       XIMPOL(I)=XIMP(I)                                   00004080
ISN 0348       XIMP(I)=T                                           00004090
ISN 0349       T=YAFOLD(I)+DT2*YACFD(I)                            00004100
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ISN 0350          YAFOLD(I)=YACF(I)
ISN 0351          YACF(I)=T
ISN 0352          T=YIMPOL(I)+DT2*YACF(I)
ISN 0353          YIMPOL(I)=YIMP(I)
ISN 0354          YIMP(I)=T
ISN 0355          T=ZAFOLD(I)+DT2*ZACFD(I)
ISN 0356          ZAFOLD(I)=ZACF(I)
ISN 0357          ZACF(I)=T
ISN 0358          T=ZIMPOL(I)+DT2*ZACF(I)
ISN 0359          ZIMPOL(I)=ZIMP(I)
ISN 0360          ZIMP(I)=T
ISN 0361      800 FORMAT(/'MAIN',2X,'I=',I5,2X,'ZAFOLD=',E15.6,2X,'ZACFD =',E15.6,
                 1 2X,'ZACF  =',E15.6,2X,'ZIMP  =',E15.6,2X,'ZIMPOL=',E15.6/)
ISN 0362      801 FORMAT(/6X,'J=',I5,2X,'ZANPFO=',E15.6,2X,'ZNPFD =',E15.6,2X,
                 1 'ZACNPF=',E15.6,2X,'ZIMPNP=',E15.6,2X,'ZIMNPL=',E15.6/)
ISN 0363      300 CONTINUE
ISN 0364          IF(NNP.EQ.0) GO TO 400
ISN 0366          DO 410 J=1,NNP
ISN 0367          T=XANPFO(J)+DT2*XNPFD(J)
ISN 0368          XANPFO(J)=XACNPF(J)
ISN 0369          XACNPF(J)=T
ISN 0370          T=XIMNPL(J)+DT2*XACNPF(J)
ISN 0371          XIMNPL(J)=XIMPNP(J)
ISN 0372          XIMPNP(J)=T
ISN 0373          T=YANPFO(J)+DT2*YNPFD(J)
ISN 0374          YANPFO(J)=YACNPF(J)
ISN 0375          YACNPF(J)=T
ISN 0376          T=YIMNPL(J)+DT2*YACNPF(J)
ISN 0377          YIMNPL(J)=YIMPNP(J)
ISN 0378          YIMPNP(J)=T
ISN 0379          T=ZANPFO(J)+DT2*ZNPFD(J)
ISN 0380          ZANPFO(J)=ZACNPF(J)
ISN 0381          ZACNPF(J)=T
ISN 0382          T=ZIMNPL(J)+DT2*ZACNPF(J)
ISN 0383          ZIMNPL(J)=ZIMPNP(J)
ISN 0384          ZIMFNP(J)=T
ISN 0385      410 CONTINUE
ISN 0386      400 CONTINUE
ISN 0387          IF(IEER.NE.1) GO TO 420
ISN 0389          PRINT 7100
ISN 0390     7100 FORMAT(1H1 // 1X,'TERMINATION DUE TO ENERGY ERROR MESSAGE')
ISN 0391     7201 IF(IESE.NE.1) GO TO 7202
ISN 0393          PRINT 7301
ISN 0394     7301 FORMAT(/ 1X,'26. IESE=1 TOTAL STRAIN ENERGY IS NEGATIVE')
ISN 0395     7202 IF(IEPSE.NE.1) GO TO 7203
ISN 0397          PRINT 7302
ISN 0398     7302 FORMAT(/ 1X,'27. IEPSE=1 ELEMENT STRAIN ENERGY EXCEEDS NTOL2',
                *       ' VALUE')
ISN 0399     7203 IF(IEDE.NE.1) GO TO 7204
ISN 0401          PRINT 7303
ISN 0402     7303 FORMAT(/ 1X,'28. IEDE=1 TOTAL DAMPING ENERGY IS NEGATIVE')
ISN 0403     7204 IF(IEPDE.NE.1) GO TO 7205
ISN 0405          PRINT 7304
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ISN 0406      7304 FORMAT(/ 1X,'29. IEPDE=1 ELEMENT DAMPING ENERGY EXCEEDS NTOL2',
                 *       ' VALUE')
ISN 0407      7205 IF(IECE.NE.1) GO TO 7206
ISN 0409           PRINT 7305
ISN 0410      7305 FORMAT(/ 1X,'30. IECE=1 TOTAL CRUSHING ENERGY IS NEGATIVE')
ISN 0411      7206 IF(IEPCE.NE.1) GO TO 7207
ISN 0413           PRINT 7306
ISN 0414      7306 FORMAT(/ 1X,'31. IEPCE=1 MASS CRUSHING ENERGY EXCEEDS NTOL2',
                 *       ' VALUE')
ISN 0415      7207 IF(IEFE.NE.1) GO TO 7208
ISN 0417           PRINT 7307
ISN 0418      7307 FORMAT(/ 1X,'32. IEFE=1 TOTAL FRICTION ENERGY IS NEGATIVE')
ISN 0419      7208 IF(IEPFE.NE.1) GO TO 7209
ISN 0421           PRINT 7308
ISN 0422      7308 FORMAT(/ 1X,'33. IEPFE=1 MASS FRICTION ENERGY EXCEEDS NTOL2',
                 *       ' VALUE')
ISN 0423      7209 IF(IEDEV.NE.1) GO TO 7210
ISN 0425           PRINT 7309
ISN 0426      7309 FORMAT(/ 1X,'34. IEDEV=1 MASS DEVIATION EXCEEDS NTOL3 VALUE')
ISN 0427      7210 IF(IETOT.NE.1) GO TO 7211
ISN 0429           PRINT 7310
ISN 0430      7310 FORMAT(/ 1X,'35. IETOT=1 TOTAL ENERGY CHANGE EXCEEDS NTOL1',
                 *       ' VALUE')
ISN 0431      7211 GO TO 500
ISN 0432       420 IF(TIME-TMAX) 190,190,500
ISN 0433       500 IF(KRCONT.LE.0) GO TO 4500
ISN 0435           PRINT 2000
ISN 0436      2000 FORMAT(1H1 // 1X,'SUMMARY OF INTERNAL BEAM YIELDING ',
                 1 'AND RUPTURE'/ 18X,'BEAM',13X,'BEAM DIRECTION FOR',2X,
                 2 'TENSION(+) OR'/4X,'TIME',6X,'IJ',3X,'I',3X,'J',3X,'M',3X,'N',
                 3 3X,'YIELD',6X,'RUPTURE',2X,'COMPRESSION(-)'/)
ISN 0437           DO 3500 JJ=1,KRCONT
ISN 0438           IJ = KRBEAM(1,JJ)
ISN 0439           PRINT 3000,TKR(JJ),KRBEAM(1,JJ),IG(IJ),JG(IJ),MG(IJ),NG(IJ),
                 1 KRBEAM(2,JJ),KRBEAM(3,JJ),KRBEAM(4,JJ)
ISN 0440      3500 CONTINUE
ISN 0441      3000 FORMAT(1X,F9.6,3X,I3,4(2X,I2),5X,I1,11X,I1,10X,I2)
ISN 0442      4500 IF(KKONT.LE.0) GO TO 5600
ISN 0444           PRINT 2500
ISN 0445      2500 FORMAT(1H1//6X,'SUMMARY OF EXTERNAL SPRING LOADING AND UNLOADING'
                 1 //  10X,'TYPES;1=INITIAL LOADING 2=MAX.LOADING 3=UNLOAD TO ZERO
                 2 FORCE 4=INITIATION OF RELOAD'//10X,'NOTE:SPRING RELOADS AT ZERO
                 3 FORCE(SEQ.1,2,3,4) OR AT FINITE FORCE VALUE(SEQ.1,2,4)'
                 4 //       10X,'NOTE:INITIAL DEFLECTION IS FIRST IMPACT IF NYPE=1,
                 5 OTHERWISE IT IS POINT AT WHICH RELOADING OCCUR FOR NTYPE=4'
                 6 //1X,'TIME(SEC)',2X,'MASS',3X,'NODE',2X,'DIRECTION',
                 7 2X,'TYPE',3X,'INITIAL',9X,'MAXIMUM',15X,'UNLOADED'
                 8 / 13X,'NO.',4X,'NO.',3X,'L=1,2,3',4X,'NO.' ,2X,
                 9'DEFLECTION',3X,'FORCE',1X,'&/OR',1X,'DEFLECT',1X,'DEFLECT',
                 A 2X,'&',1X,'FORCE')
ISN 0446           DO 3600 JJ=1,KKONT
ISN 0447           PRINT 3100,TSP(JJ),KKSP(1,JJ),KKSP(2,JJ),KKSP(3,JJ),KKSP(4,JJ),
                 1 EXSP(1,JJ),EXSP(2,JJ),EXSP(3,JJ),EXSP(4,JJ),EXSP(5,JJ)
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ISN 0448      3600 CONTINUE
ISN 0449      3100 FORMAT(1X,F9.6,3X,3(I2,5X),2X,I2,3X,F8.4,2X,E10.2,2(2X,F8.4),2X,
                  1 E10.2)
                C
                C     SUMMARY TABLE FOR PLASTIC HINGE
                C
ISN 0450      5600 IF(KPL.LE.0) GO TO 5500
ISN 0452           PRINT 5610
ISN 0453      5610 FORMAT(//,1X,'SUMMARY OF PLASTIC HINGE FORMATIONS')
ISN 0454           PRINT 5620
ISN 0455      5620 FORMAT(/,17X,'BEAM',9X,'BEAM END'/4X,'TIME',5X,
                  1 'IJ  I  J  M  N',3X,'MASS NO.   DIRECTION')
ISN 0456           DO 5630 K=1,KPL
ISN 0457           TIMEPL=TPL(K)
ISN 0458           IJ=BPL(K,1)
ISN 0459           I=IG(IJ)
ISN 0460           J=JG(IJ)
ISN 0461           M=MG(IJ)
ISN 0462           N=NG(IJ)
ISN 0463           MNUMB=BPL(K,3)
ISN 0464           NDIREC=BPL(K,2)
ISN 0465           PRINT 5640,TIMEPL,IJ,I,J,M,N,MNUMB,NDIREC
ISN 0466      5640 FORMAT(1X,F9.6,2X,5I3,5X,I3,9X,I2)
ISN 0467      5630 CONTINUE
ISN 0468      5500 IF (KPEN.LE.0)  GO TO 6000
ISN 0470           PRINT 5501
ISN 0471      5501 FORMAT(1H1,7X,'CONTROL VOLUME PENETRATIONS' //)
ISN 0472           PRINT 5502
ISN 0473      5502 FORMAT(1H ,13X,'TIME',10X,'MASS' /)
ISN 0474           PRINT 5503,(TPEN(K),IPEN(K),K=1,KPEN)
ISN 0475      5503 FORMAT(1H ,10X,F10.5,I10)
                C*****PRINT ENERGY SUMMARY
ISN 0476      6000 PRINT 9
ISN 0477         9 FORMAT(1H1 // 1X,'SUMMARY OF ENERGY DISTRIBUTION' ///)
ISN 0478           PRINT 10
ISN 0479        10 FORMAT(10X,'PERCENT',2X,'PERCENT',5(11X,'PERCENT'),10X,'PERCENT'/
                  1 10X,'MAXIMUM',3X,'TOTAL',14X,'OF',4(16X,'OF'),15X,'OF'/11X,
                  2 'ENERGY',2X,'SYSTEM',3X,'KINETIC',2X,'CURRENT',1X,
                  3 'POTENTIAL',1X,'CURRENT',2X,'STRAIN',3X,'CURRENT',2X,
                  4 'DAMPING',2X,'CURRENT',1X,'CRUSHING',2X,'CURRENT',1X,
                  5 'FRICTION',1X,'CURRENT' / 2X,'TIME',3X,'DEVIATION',1X,'ENERGY',
                  6 5(3X,'ENERGY',4X,'TOTAL'),3X,'ENERGY',3X,'TOTAL' /)
                C     DTP = IPRINT*DELTAT
                C     TIME = -DTP
ISN 0480           INGO = INGOLD + 1
ISN 0481           DO 20 I = INGO,INGSCT
                C     TIME = TIME+DTP
                C     ITIME = TIME*1000 + .5
                C     IF (ITIME .LT. MSECIN) GO TO 20
ISN 0482           ETOT = 0.0
ISN 0483           DO 30 J = 1,6
ISN 0484        30 ETOT = ETOT+ENGSMY(J,I)
ISN 0485           PCTTO = ETOT/ETOTTO
```

```
ISN 0486          DO 40 J = 1,6                                                           00005700
ISN 0487       40 PERCNT(J) = ENGSMY(J,I)/ETOT                                            00005710
ISN 0488          PRINT 60, ETIME(I),DEV(I),PCTT0,(ENGSMY(J,I),PERCNT(J),J=1,6)           00005720
ISN 0489       60 FORMAT(1X,F6.5,2X,F9.6,2PF7.2,6(1PE11.3,2PF7.2))                        00005730
ISN 0490       20 CONTINUE                                                                00005740
ISN 0491          TMAX=TIME                                                               00005750
ISN 0492          CALL PREPLT(TPRINT,NM,NNP,NB,NSP,NDRI,MSECIN)                           00005760
ISN 0493          GO TO 1                                                                 00005770
ISN 0494     1000 CONTINUE                                                                00005780
ISN 0495          STOP                                                                    00005790
ISN 0496          END                                                                     00005800
```

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          ************************************************************************************
          *                                                                                  *
          *                                                                                  *
          *                                                                                  *
          *                                                                                  *
          *                                                                                  *
          *                 LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.     *
          *                                                                                  *
          ************************************************************************************

            COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                               SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                 C            DATA SET D2334ACCEL AT LEVEL 005 AS OF 06/25/79
   ISN 0002            SUBROUTINE ACCELT(MASDEX,X1,YC,ZC,A1,A2,A3,TIME,NPTSP,NPTS)
                 C
                 C     REVISED 10-13-77
                 C
   ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)
   ISN 0004            COMMON/INAC/   ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT
   ISN 0005            COMMON/INDEAC/ NACC
   ISN 0006            ISAV = 1
   ISN 0007            TT = TIME
   ISN 0008       6105 DO 6100 I=ISAV,NACC
   ISN 0009            I1 = I
   ISN 0010       6200 FORMAT(2I5)
   ISN 0011            IF(INDEX(I,1).EQ.MASDEX) GO TO 6101
   ISN 0013       6100 CONTINUE
   ISN 0014            RETURN
   ISN 0015       6101 ISAV = I1 + 1
   ISN 0016            JSTRT = JAY(I1,1)
   ISN 0017            NPTS = JAY(I1,2)
   ISN 0018            NPTS=NPTSP+NPTS
   ISN 0019            JSTOP=NPTS
   ISN 0020            K=NPTSP+1
   ISN 0021       6102 K = K+1
   ISN 0022       6201 FORMAT(5I5)
   ISN 0023            IF(TT.GE.TIM(K-1).AND.TT.LT.TIM(K)) GO TO 6103
   ISN 0025            IF(K.NE.JSTOP) GO TO 6102
   ISN 0027            IREF=K
   ISN 0028            NPTSP=NPTS
   ISN 0029            GO TO 6104
   ISN 0030       6103 IREF = K-1
   ISN 0031            NPTSP=NPTS
   ISN 0032       6104 CALL INTERP(IREF,TT,ACOUT)
   ISN 0033            IDER = INDEX(I,2)
   ISN 0034            GO TO (6111,6112,6113,6114,6115,6116),IDER
   ISN 0035            PRINT 6106,IDER
   ISN 0036       6106 FORMAT(1X,'1. IDER OUT OF RANGE,VALUE = ',I2)
   ISN 0037            RETURN
   ISN 0038       6111 X1 = ACOUT
   ISN 0039            GO TO 6107
   ISN 0040       6112 YC = ACOUT
   ISN 0041            GO TO 6107
```

```
ISN 0042      6113 ZC = ACOUT                                    00000410
ISN 0043           GO TO 6107                                    00000420
ISN 0044      6114 A1 = ACOUT                                    00000430
ISN 0045           GO TO 6107                                    00000440
ISN 0046      6115 A2 = ACOUT                                    00000450
ISN 0047           GO TO 6107                                    00000460
ISN 0048      6116 A3 = ACOUT                                    00000470
ISN 0049      6107 IF(ISAV.GT.NACC) RETURN                       00000480
ISN 0051           GO TO 6105                                    00000490
ISN 0052           END                                           00000500
```

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*****************************************************************************************
*                                                                                       *
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*                                                                                       *
*             LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.              *
*                                                                                       *
*****************************************************************************************

    COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
          C         DATA SET D2334CFORC AT LEVEL 004 AS OF 06/25/79
          C         DATA SET D2332VCF   AT LEVEL 001 AS OF 01/27/78
          C         DATA SET D2332VCFOR AT LEVEL 001 AS OF 09/06/77
          C         DATA SET D2332FCF   AT LEVEL 009 AS OF 09/02/77
ISN 0002              SUBROUTINE CFORCE
          C
ISN 0003              IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004              REAL*8 KUN
ISN 0005              INTEGER*4 TITLE(40)
ISN 0006              INTEGER*2 N1,NN,IBS,JBS
ISN 0007              INTEGER*2 MTEMP(40)
ISN 0008              INTEGER*2 IJPR,IG,JG
ISN 0009              INTEGER*2 II(40),KK(40),MM(40),INP(50),MNP(50),MG(150),NG(150)
ISN 0010              DIMENSION VA(3),VADOT(3),PBAR(3),XLNGTH(3),IISP(3),XXLBAR(3),
                     1 FSP(3,3),XVOC(3,3),C4(3),C5(3),S(3),SDOT(3),PL(3,3)
ISN 0011              DIMENSION DPQRIN(4),DXYZ(3),DXYZPR(3),TERM(6)
ISN 0012              DIMENSION XVOCSL(3,3),DVC3(3)
ISN 0013              DIMENSION FSPB(3,3),FSPF(3,3),XVOCB(3,3),XVOCF(3,3),TERMF(6)
ISN 0014              DIMENSION DVC(3),DVC1(3),DVCDOT(3),C4SL(3),C5SL(3),VCINT(3),
                     1 VEEDT(3),VEEC3(3),VEECS3(3)
ISN 0015              DIMENSION TT(3),XXC(6),RTERM(6),RTERMF(6)
ISN 0016              DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)
ISN 0017              DIMENSION LSTEST(3)
ISN 0018              DIMENSION ETERM(3),ETB(3),ETF(3)
ISN 0019              COMMON/CFIC/ SINBET,COSBET,ABETA(9)
ISN 0020              COMMON/CFIR/ SIFL(40),SAFL(40),SBFL(40),SFFL(40),XKEFL(40)
ISN 0021              COMMON/CFPR/ FSPRNG(40,8),DELG(40)
ISN 0022              COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),
                     1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT
ISN 0023              COMMON/INPR/ NDRI,NSP
ISN 0024              COMMON/INCFIC/ BETA
ISN 0025              COMMON/INIDCP/ YDP(80)
ISN 0026              COMMON/MACF/IBS(40),FSPOP(40), SCP(40), JBS(40),
                     1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                     2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0027              COMMON/MACFIN/ TMAX,IPRINT
ISN 0028              COMMON/MCFIII/ SYMFLG
ISN 0029              COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0030              COMMON/NP01I2/ II,KK,MM
ISN 0031              COMMON/NP00I4/ NNP
ISN 0032              COMMON/NP00R8/ RX,RY,RZ
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ISN 0033          COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
ISN 0034          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                 A CEIKF(40),
                 B SBAR(40),XUN(40),MAXNM,MAXIGS,MAXTBL,
                 C NM,NB,I,J,IG(150),JG(150),
                 D N1(900),NN(40),IJPR(150)
ISN 0035          EQUIVALENCE (C4(1),DXYZ(1)),(C5(1),DXYZPR(1))
ISN 0036          SIGN(X1,X2) = DSIGN(X1,X2)
ISN 0037          SQRT(X) = DSQRT(X)
ISN 0038          AMAX1(X,Y) = DMAX1(X,Y)
ISN 0039          ABS(X) = DABS(X)
ISN 0040          ONE = 1.
ISN 0041          VA(1) = X(I)
ISN 0042          VA(2) = Y(I)
ISN 0043          VA(3) = Z(I)
ISN 0044          VADOT(1) = XDOT(I)
ISN 0045          VADOT(2) = YDOT(I)
ISN 0046          VADOT(3) = ZDOT(I)
ISN 0047          PBAR(1) = P(I)
ISN 0048          PBAR(2) = Q(I)
ISN 0049          PBAR(3) = R(I)
            C
            C     DETERMINE WHAT NODE POINTS M MUST BE ANALYZED FOR THIS
            C     MASS POINT I.
            C
ISN 0050          KOUNT = 0
ISN 0051          DO 10 IKM=1,NSP
            C
            C ZERO GROUND DEFL. AT TIME = 0.
            C
ISN 0052          IF(TIME.NE.0.) GO TO 25
ISN 0054          DELG(IKM) = 0.
ISN 0055       25 IF(I.NE.II(IKM)) GO TO 10
ISN 0057          IF(KOUNT.NE.0) GO TO 11
ISN 0059          KOUNT = 1
ISN 0060          MTEMP(KOUNT) = MM(IKM)
ISN 0061          GO TO 10
ISN 0062       11 DO 13 JJ=1,KOUNT
ISN 0063          IF(MTEMP(JJ).EQ.MM(IKM)) GO TO 10
ISN 0065       13 CONTINUE
ISN 0066          KOUNT = KOUNT+1
ISN 0067          MTEMP(KOUNT) = MM(IKM)
ISN 0068       10 CONTINUE
            C
```

```
          C     NOW DO ALL CFORCE CALCULATIONS INSIDE AN M LOOP FROM 1
          C     TO KOUNT.
          C
ISN 0069        DO 20 IN=1,KOUNT
ISN 0070        M = MTEMP(IN)
          C
          C     DETERMINE WHICH K'S HAVE SPRINGS FOR CURRENT I AND M,
          C     AND SET IISP(K).
          C
ISN 0071        DO 14 K=1,3
ISN 0072        IISP(K) = 0
ISN 0073        DO 16 IKM=1,NSP
ISN 0074        IF(I.EQ.II(IKM).AND.M.EQ.MM(IKM).AND.K.EQ.KK(IKM)) IISP(K)=1
ISN 0076     16 CONTINUE
ISN 0077     14 CONTINUE
          C
          C     DETERMINE COMPONENTS OF RADIUS VECTOR FROM MASS POINT
          C     TO NODE POINT.
          C
ISN 0078        IF(M.NE.0) GO TO 18
ISN 0080        RRX = 0.
ISN 0081        RRY = 0.
ISN 0082        RRZ = 0.
ISN 0083        GO TO 19
ISN 0084     18 DO 17 JJ=1,NNP
ISN 0085        IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 15
ISN 0087     17 CONTINUE
ISN 0088        PRINT 9,I,M
ISN 0089      9 FORMAT(1X,'2. NO SUCH NODE POINT I,M',2I5)
ISN 0090        STOP
ISN 0091     15 RRX = RX(JJ)
ISN 0092        RRY = RY(JJ)
ISN 0093        RRZ = RZ(JJ)
ISN 0094     19 CONTINUE
          C INITIALIZE SOME MORE
ISN 0095        DO 910 K = 1,3
ISN 0096        DO 22 IKM=1,NSP
ISN 0097        IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 24
ISN 0099     22 CONTINUE
ISN 0100     24 XLNGTH(K) = XLBAR(IKM)
ISN 0101        XXLBAR(K) = XLBAR(IKM)
ISN 0102        VCINT(K) = 0.
ISN 0103        SDOT(K) = 0.
ISN 0104        DO 915 JJ = 1,3
ISN 0105        FSP(JJ,K) = 0.0
ISN 0106        FSPB(JJ,K) = 0.
ISN 0107        FSPF(JJ,K) = 0.
ISN 0108        XVOCSL(JJ,K) = 0.
ISN 0109        XVOCB(JJ,K) = 0.
ISN 0110        XVOCF(JJ,K) = 0.
ISN 0111    915 XVOC(JJ,K) = 0.0
ISN 0112        DO 911 K2=1,7
ISN 0113        FSPRNG(IKM,K2) = 0.
```

```
ISN 0114        911 CONTINUE                                                         00001470
ISN 0115        910 CONTINUE                                                         00001480
              C LOOP G                                                               00001490
              C   CALCULATE VC3, C4, C5 IN GROUND AND SLOPE AXES                     00001500
ISN 0116            DVR1 = AI(1)*RRX+AI(4)*RRY+AI(7)*RRZ                             00001510
ISN 0117            DVR3 = AI(3)*RRX+AI(6)*RRY+AI(9)*RRZ                             00001520
ISN 0118            DVRD1 = AIDOT(1)*RRX+AIDOT(4)*RRY+AIDOT(7)*RRZ                   00001530
ISN 0119            DVRD3 = AIDOT(3)*RRX+AIDOT(6)*RRY+AIDOT(9)*RRZ                   00001540
ISN 0120            DO 920 K = 1,3                                                   00001550
ISN 0121            IF (IISP(K)) 925,920,925                                         00001560
ISN 0122        925 ISUB1 = 3*K-2                                                    00001570
ISN 0123            DVC1(K) = AI(ISUB1) * XXLBAR(K)                                  00001580
ISN 0124            ISUB3 = 3*K                                                      00001590
ISN 0125            DVC3(K) = AI(ISUB3) * XXLBAR(K)                                  00001600
ISN 0126            DVCSL3 = SINBET * DVC1(K) + COSBET * DVC3(K)                     00001610
ISN 0127            VC1 = VA(1) + DVC1(K)+DVR1                                       00001620
ISN 0128            VC3 = VA(3) + DVC3(K)+DVR3                                       00001630
ISN 0129            VCSL3 = SINBET * VC1 + COSBET * VC3                              00001640
ISN 0130            DVCD1 = AIDOT(ISUB1) * XXLBAR(K)                                 00001650
ISN 0131            DVCD3 = AIDOT(ISUB3) * XXLBAR(K)                                 00001660
ISN 0132            DVCSD3 = SINBET * DVCD1 + COSBET * DVCD3                         00001670
ISN 0133            VCD1 = VADOT(1) + DVCD1+DVRD1                                    00001680
ISN 0134            VCD3 = VADOT(3) + DVCD3+DVRD3                                    00001690
ISN 0135            VCSD3 = SINBET * VCD1 + COSBET * VCD3                            00001700
ISN 0136            VEEC3(K) = VC3                                                   00001710
ISN 0137            VEECS3(K) = VCSL3                                                00001720
ISN 0138            IF (DVC3(K)) 927,926,927                                         00001730
ISN 0139        926 C4(K) = 0.                                                       00001740
ISN 0140            C5(K) = 0.                                                       00001750
ISN 0141            GO TO 928                                                        00001760
ISN 0142        927 C4(K) = VC3/DVC3(K)                                              00001770
ISN 0143            C5(K) = (DVC3(K) * VCD3 - VC3 * DVCD3)/(DVC3(K) * DVC3(K))       00001780
ISN 0144        928 IF (DVCSL3) 930,929,930                                          00001790
ISN 0145        929 C4SL(K) = 0.                                                     00001800
ISN 0146            C5SL(K) = 0.                                                     00001810
ISN 0147            GO TO 920                                                        00001820
ISN 0148        930 C4SL(K) = VCSL3/DVCSL3                                           00001830
ISN 0149            C5SL(K) = (DVCSL3 * VCSD3 - VCSL3 * DVCSD3)/(DVCSL3 * DVCSL3)    00001840
ISN 0150        920 CONTINUE                                                         00001850
              C LOOP H                                                               00001860
              C   CALCULATE X COORD OF SPRING INTERSECTION PT TO SEE IF LEVEL OR     00001870
              C        SLOPE IS USED.                                                00001880
ISN 0151            DO 30 K = 1,3                                                    00001890
ISN 0152            IF (IISP(K)) 35,30,35                                            00001900
ISN 0153         35 IF (VEEC3(K)) 36,36,40                                           00001910
ISN 0154         36 IF (VEECS3(K)) 30,30,40                                          00001920
ISN 0155         40 VCINT(K) = VA(1) + DVC1(K) * (1-C4(K))+DVR1                      00001930
ISN 0156            IF(DVC3(K).LE.0.) VCINT(K) = 1000.D0                             00001940
              C     THIS TAKES CARE OF HORIZONTAL AND UPWARD POINTING SPRINGS        00001950
ISN 0158            ISUB = 3*(K-1)                                                   00001960
ISN 0159            BARL = XXLBAR(K)                                                 00001970
ISN 0160            SUM = 0.0                                                        00001980
ISN 0161            SUMD = 0.0                                                       00001990
```

```
          C  LOOP J1  CALCULATE ALL DVC & DVCDOT IN GROUND SYSTEM
ISN 0162          DO 50 J=1,3
ISN 0163          ISUB = ISUB + 1
ISN 0164          DVC(J) = AI(ISUB) * BARL
ISN 0165          DVCDOT(J) = AIDOT(ISUB) * BARL
ISN 0166       50 CONTINUE
          C  LOOP J2  CALCULATE DVC & DVCDOT IN SLOPE AXES IF APPROPRIATE. FORM
          C           SUM & SUMD FOR SK & SKDOT.
ISN 0167          DO 52 J=1,3
ISN 0168          IF (BETA) 54,56,54
ISN 0169       54 IF (VCINT(K)) 56,56,58
ISN 0170       58 SUM1 = 0.
ISN 0171          SUM2 = 0.
ISN 0172          JSUB = 3*(J-1)
ISN 0173          DO 53 L=1,3
ISN 0174          JSUB = JSUB + 1
ISN 0175          SUM1 = SUM1 + ABETA(JSUB) * DVC(L)
ISN 0176          SUM2 = SUM2 + ABETA(JSUB) * DVCDOT(L)
ISN 0177       53 CONTINUE
ISN 0178          DVEEC = SUM1
ISN 0179          DVEECD = SUM2
ISN 0180          C4BAR = C4SL(K)
ISN 0181          C5BAR = C5SL(K)
ISN 0182          LSTEST(K) = 1.
ISN 0183          GO TO 59
ISN 0184       56 DVEEC = DVC(J)
ISN 0185          DVEECD = DVCDOT(J)
ISN 0186          C4BAR = C4(K)
ISN 0187          C5BAR = C5(K)
ISN 0188          LSTEST(K) = 0
ISN 0189       59 DVP = C4BAR * DVEEC
ISN 0190          DDP = C4BAR * DVEECD + C5BAR * DVEEC
ISN 0191          SUM = SUM + DVP * DVP
ISN 0192          SUMD = SUMD + DVP * DDP
ISN 0193       52 CONTINUE
ISN 0194          SK = SQRT(SUM)
ISN 0195          S(K) = SK
ISN 0196          SDOT(K) = SUMD/SK
          C GET LENGTH
ISN 0197          DO 822 IKM=1,NSP
ISN 0198          IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 824
ISN 0200      822 CONTINUE
ISN 0201      824 SC(IKM) = SK
ISN 0202          IF(BARL) 55,60,60
ISN 0203       55 T = -BARL-SK+DELG(IKM)
ISN 0204          T = -T
ISN 0205          GO TO 65
ISN 0206       60 T = BARL-SK+DELG(IKM)
ISN 0207       65 XLNGTH(K) = T
ISN 0208       30 CONTINUE
ISN 0209          PL(1,1) = -SDOT(1)*SIGN(ONE,XXLBAR(1))
ISN 0210          PL(2,2) = -SDOT(2)*SIGN(ONE,XXLBAR(2))
ISN 0211          PL(3,3) = -SDOT(3)*SIGN(ONE,XXLBAR(3))
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```
ISN 0212          PL(1,1) = 0.                                          00002530
ISN 0213          PL(2,2) = 0.                                          00002540
ISN 0214          PL(3,3) = 0.                                          00002550
ISN 0215          PL(2,1) = PBAR(3)*XLNGTH(1)                           00002560
ISN 0216          PL(3,1) = -PBAR(2)*XLNGTH(1)                          00002570
ISN 0217          PL(1,2) = -PBAR(3)*XLNGTH(2)                          00002580
ISN 0218          PL(3,2) = PBAR(1)*XLNGTH(2)                           00002590
ISN 0219          PL(1,3) = PBAR(2)*XLNGTH(3)                           00002600
ISN 0220          PL(2,3) = -PBAR(1)*XLNGTH(3)                          00002610
ISN 0221          IF(M.EQ.0) GO TO 76                                   00002620
ISN 0223          TT(1) = -PBAR(3)*RRY+PBAR(2)*RRZ                      00002630
ISN 0224          TT(2) =  PBAR(3)*RRX-PBAR(1)*RRZ                      00002640
ISN 0225          TT(3) = -PBAR(2)*RRX+PBAR(1)*RRY                      00002650
ISN 0226          DO 77 K=1,3                                           00002660
ISN 0227          DO 78 JJ=1,3                                          00002670
ISN 0228          PL(JJ,K) = PL(JJ,K)+TT(JJ)                            00002680
ISN 0229       78 CONTINUE                                              00002690
ISN 0230       77 CONTINUE                                              00002700
            C LOOP K                                                    00002710
ISN 0231       76 DO 75 JJ = 1,3                                        00002720
ISN 0232          ISUB = JJ-3                                           00002730
ISN 0233          VAD = VADOT(JJ)                                       00002740
            C LOOP L                                                    00002750
ISN 0234          DO 80 K = 1,3                                         00002760
ISN 0235          IF(IISP(K)) 85,80,85                                  00002770
ISN 0236       85 IF(VEEC3(K)) 81,81,90                                 00002780
ISN 0237       81 IF(VEECS3(K)) 80,80,90                                00002790
ISN 0238       90 SUM = 0.0                                             00002800
            C LOOP M                                                    00002810
ISN 0239          DO 95 L = 1,3                                         00002820
ISN 0240          ISUB = ISUB+3                                         00002830
ISN 0241       95 SUM = SUM+AI(ISUB)*PL(L,K)                            00002840
ISN 0242          VEEDOT(JJ,K) = VAD+SUM                                00002850
ISN 0243       80 CONTINUE                                              00002860
ISN 0244       75 CONTINUE                                              00002870
            C   CALCULATE CONTACT POINT VELOCITIES ON SLOPE.            00002880
ISN 0245          IF (BETA) 98,96,98                                    00002890
ISN 0246       98 DO 101 K=1,3                                          00002900
ISN 0247          IF (VCINT(K)) 101,101,94                              00002910
ISN 0248       94 DO 97 J=1,3                                           00002920
ISN 0249          SUM = 0.                                              00002930
ISN 0250          JSUB = 3*(J-1)                                        00002940
ISN 0251          DO 99 L=1,3                                           00002950
ISN 0252          JSUB = JSUB + 1                                       00002960
ISN 0253          SUM = SUM + ABETA(JSUB) * VEEDOT(L,K)                 00002970
ISN 0254       99 CONTINUE                                              00002980
ISN 0255          VEEDT(J) = SUM                                        00002990
ISN 0256       97 CONTINUE                                              00003000
ISN 0257          DO 102 JJ=1,3                                         00003010
ISN 0258          VEEDOT(JJ,K) = VEEDT(JJ)                              00003020
ISN 0259      102 CONTINUE                                              00003030
ISN 0260      101 CONTINUE                                              00003040
            C LOOP N                                                    00003050
```

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ISN 0261        96 DO 105 K = 1,3                                                    00003060
ISN 0262           IF(IISP(K)) 110,105,110                                           00003070
ISN 0263       110 IF(VEEC3(K)) 111,111,115                                          00003080
ISN 0264       111 IF(VEECS3(K)) 105,105,115                                         00003090
ISN 0265       115 SK = S(K)                                                         00003100
             C                                                                       00003110
             C     GET SPRING NUMBER TO USE INPUT DATA SUBSCRIPTED BY IKM.           00003120
             C                                                                       00003130
ISN 0266           DO 1002 IKM=1,NSP                                                 00003140
ISN 0267           IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 1003     00003150
ISN 0269      1002 CONTINUE                                                          00003160
ISN 0270      1003 SC(IKM) = SK                                                      00003170
             C                                                                       00003180
             C  CALCULATION OF FSPO.                                                 00003190
             C                                                                       00003200
ISN 0271           IF(SDOT(K).LT.0.) GO TO 140                                       00003210
ISN 0273           IF(SK.LT.SBAR(IKM)) GO TO 140                                     00003220
             C                                                                       00003230
             C  LOADING PATH.                                                        00003240
             C                                                                       00003250
ISN 0275           IF(IBS(IKM).NE.0) GO TO 125                                       00003260
ISN 0277           IF(SK.GT.SFFL(IKM)) GO TO 130                                     00003270
             C                                                                       00003280
             C  NORMAL FSPO CALCULATIONS FOR LOADING CASE.                           00003290
             C                                                                       00003300
ISN 0279           FSPO = FSPOF(IKM)                                                 00003310
ISN 0280           IF(SK.GE.SBFL(IKM)) GO TO 150                                     00003320
ISN 0282           IF(SK.GE.SAFL(IKM)) GO TO 148                                     00003330
ISN 0284           FSPO = FSPOI(IKM)                                                 00003340
ISN 0285           IF(SK.GE.SIFL(IKM)) GO TO 150                                     00003350
ISN 0287           FSPO = FSPO*SK/SIFL(IKM)                                          00003360
ISN 0288           GO TO 150                                                         00003370
ISN 0289       148 FSPO = FSPOI(IKM)+(SK-SAFL(IKM))*(FSPO-FSPOI(IKM))/               00003380
                 1 (SBFL(IKM)-SAFL(IKM))                                             00003390
ISN 0290           GO TO 150                                                         00003400
             C                                                                       00003410
             C  FSPO CALCULATIONS ON BOTTOMING SPRING.                               00003420
             C                                                                       00003430
ISN 0291       130 IBS(IKM) = 1                                                      00003440
ISN 0292       125 FSPO = FSPOF(IKM)+XKEFL(IKM)*(SK-SFFL(IKM))                       00003450
ISN 0293       150 FSPBAR(IKM) = FSPO                                                00003460
ISN 0294           SBAR(IKM) = SK                                                    00003470
ISN 0295           NN(IKM) = 0                                                       00003480
ISN 0296           GO TO 155                                                         00003490
             C                                                                       00003500
             C  UNLOADING AND RELOADING PATHS.                                       00003510
             C                                                                       00003520
ISN 0297       140 IF(NN(IKM).NE.0) GO TO 135                                        00003530
ISN 0299           IF(IBS(IKM).EQ.0) GO TO 145                                       00003540
             C                                                                       00003550
             C  UNLOADING AND RELOADING ON BOTTOMING SPRING.                          00003560
             C                                                                       00003570
ISN 0301           KUN(IKM) = XKE(IKM)                                               00003580
```

```
ISN 0302           GO TO 146
              C
              C  NORMAL UNLOADING AND RELOADING.
              C
ISN 0303       145 IF(SK.LE.SAFL(IKM)) GO TO 147
ISN 0305           KUN(IKM) = (FSPOF(IKM)-FSPOI(IKM))/(SB(IKM)-SA(IKM))
ISN 0306           IF(KUN(IKM).LT.(FSPBAR(IKM)/SBAR(IKM))) GO TO 147
ISN 0308           GO TO 146
ISN 0309       147 KUN(IKM) = FSPOI(IKM)/SI(IKM)
ISN 0310       146 NN(IKM) = 1
ISN 0311       135 FSPO = FSPBAR(IKM)-(SBAR(IKM)-SK)*KUN(IKM)
ISN 0312       155 FSPD=CDAMP(IKM)*SDOT(K)
ISN 0313           IF(SDOT(K).LT. 0) FSPD=0.
ISN 0315           FSPO=FSPO+FSPD
              C    NOW IF FSPO IS NEGATIVE,SET IT EQUAL TO ZERO
ISN 0316           IF(FSPO.LT.0.) FSPO=0.
ISN 0318           FSPOF5=10.*AMAX1(FSPOF(IKM),FSPOI(IKM))
              C     CUTOFF FORCE=10*MAX OF FSPOF,FSPOI
ISN 0319           IF(FSPO.GT.FSPOF5) FSPO=FSPOF5
ISN 0321           IF(SDOT(K).LT.0.) GO TO 1020
              C      JBS=1 INITIAL LOADING OCCURS
              C      JBS=2 MAX.LOAD AND/OR DEFLECTION OCCUR
              C      JBS=3 UNLOAD TO ZERO FORCE
              C      JBS=4 RELOAD OCCURS
              C      JBS=5 MAX.LOAD DUE TO DAMPING OCCURS
ISN 0323           IF(JBS(IKM).EQ.5) GO TO 1040
              C      INITIAL LOADING SUMMARY
ISN 0325           IF(JBS(IKM).EQ.2) GO TO 1030
ISN 0327           IF(SCP(IKM).GT.0.0 .AND.FSPD.NE.0.) GO TO 1012
ISN 0329           IF(SCP(IKM).GT.0.) GO TO 1030
ISN 0331           IF(SC(IKM).LE.0.) GO TO 1030
ISN 0333           IF (JBS(IKM).GT.0) GO TO 1009
ISN 0335           KKONT=KKONT+1
ISN 0336           TSP(KKONT)=TIME
ISN 0337           EXSP(1,KKONT)=SK
ISN 0338           STEMP1(IKM)=SK
ISN 0339           KKSP(1,KKONT)=II(IKM)
ISN 0340           KKSP(2,KKONT)=MM(IKM)
ISN 0341           KKSP(3,KKONT)=KK(IKM)
ISN 0342           KKSP(4,KKONT)=1
ISN 0343      1009 IF(JBS(IKM).GT.3) GO TO 1008
ISN 0345           JBS(IKM)=1
ISN 0346           GO TO 1040
ISN 0347      1008 IF(FSPO.GT.0.0 .AND.SK.GT.SCP(IKM)) GO TO 1031
ISN 0349           GO TO 1040
              C     MAXIMUM LOADING SUMMARY
ISN 0350      1012 IF(JBS(IKM).EQ.3) GO TO 1030
ISN 0352           IF(FSPOP(IKM).LT.FSPO) GO TO 1040
ISN 0354           IF(JBS(IKM).EQ.4) JBS(IKM)=5
ISN 0356           IF(JBS(IKM).EQ.1) JBS(IKM)=5
ISN 0358      1010 IF(JBS(IKM).EQ.2) GO TO 1040
ISN 0360           KKONT=KKONT+1
ISN 0361           TSP(KKONT)=TIME
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ISN 0362          EXSP(1,KKONT)=STEMP1(IKM)                                   00004120
ISN 0363          EXSP(2,KKONT)=FSPOP(IKM)                                    00004130
ISN 0364          EXSP(3,KKONT)=SCP(IKM)                                      00004140
ISN 0365          EXSP(4,KKONT)=STEMP3(IKM)                                   00004150
ISN 0366          EXSP(5,KKONT)=STEMP2(IKM)                                   00004160
ISN 0367          STEMP4(IKM)=FSPOP(IKM)                                      00004170
ISN 0368          STEMP5(IKM)=SCP(IKM)                                        00004180
ISN 0369          KKSP(1,KKONT)=II(IKM)                                       00004190
ISN 0370          KKSP(2,KKONT)=MM(IKM)                                       00004200
ISN 0371          KKSP(3,KKONT)=KK(IKM)                                       00004210
ISN 0372          KKSP(4,KKONT)=2                                             00004220
ISN 0373          IF(FSPO.EQ.0.) GO TO 1013                                   00004230
ISN 0375          IF(JBS(IKM).NE.5) GO TO 1013                                00004240
ISN 0377          GO TO 1040                                                  00004250
ISN 0378     1013 JBS(IKM)=2                                                  00004260
ISN 0379          GO TO 1040                                                  00004270
            C      UNLOADING SUMMARY                                          00004280
ISN 0380     1020 IF(FSPOP(IKM).GT.FSPO .AND.FSPO.NE.0.0 .AND.SK.LT.SCP(IKM)) 00004290
                 1 GO TO 1010                                                 00004300
ISN 0382          IF(FSPO.NE.0.) GO  TO 1040                                  00004310
ISN 0384          IF(FSPOP(IKM).LT.FSPO) GO TO 1040                           00004320
ISN 0386          IF(JBS(IKM).EQ.3) GO TO 1040                                00004330
ISN 0388          KKONT=KKONT+1                                               00004340
ISN 0389          TSP(KKONT)=TIME                                             00004350
ISN 0390          EXSP(1,KKONT)=STEMP1(IKM)                                   00004360
ISN 0391          EXSP(2,KKONT)=STEMP4(IKM)                                   00004370
ISN 0392          EXSP(3,KKONT)=STEMP5(IKM)                                   00004380
ISN 0393          EXSP(4,KKONT)=SK                                            00004390
ISN 0394          EXSP(5,KKONT)=FSPO                                          00004400
ISN 0395          STEMP2(IKM)=FSPO                                            00004410
ISN 0396          STEMP3(IKM)=SK                                              00004420
ISN 0397          KKSP(1,KKONT)=II(IKM)                                       00004430
ISN 0398          KKSP(2,KKONT)=MM(IKM)                                       00004440
ISN 0399          KKSP(3,KKONT)=KK(IKM)                                       00004450
ISN 0400          KKSP(4,KKONT)=3                                             00004460
ISN 0401          JBS(IKM)=3                                                  00004470
ISN 0402          GO TO 1040                                                  00004480
            C      RELOADING SUMMARY                                          00004490
ISN 0403     1030 IF(JBS(IKM).EQ.2 .AND.FSPOP(IKM).NE.0.0 .AND. FSPO.GT.FSPOP(IKM)) 00004500
                 1 GO TO 1031                                                 00004510
ISN 0405          IF(JBS(IKM).EQ.1) GO TO 1040                                00004520
ISN 0407          IF(JBS(IKM).EQ.4) GO TO 1040                                00004530
ISN 0409          IF(SK.LT.STEMP3(IKM)) GO TO 1040                            00004540
ISN 0411          IF(FSPOP(IKM).NE.0.0 .AND. FSPO.LE.FSPOP(IKM)) GO TO 1040   00004550
ISN 0413     1031 KKONT=KKONT+1                                               00004560
ISN 0414          TSP(KKONT)=TIME                                             00004570
ISN 0415          EXSP(1,KKONT)=SK                                            00004580
ISN 0416          EXSP(2,KKONT)=STEMP4(IKM)                                   00004590
ISN 0417          EXSP(3,KKONT)=STEMP5(IKM)                                   00004600
ISN 0418          IF(JBS(IKM).EQ.2) GO TO 1032                                00004610
ISN 0420          EXSP(4,KKONT)=STEMP3(IKM)                                   00004620
ISN 0421          EXSP(5,KKONT)=STEMP2(IKM)                                   00004630
ISN 0422          GO TO 1033                                                  00004640
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ISN 0423      1032 EXSP(4,KKONT)=SK                                                 00004650
ISN 0424           EXSP(5,KKONT)=FSPO                                               00004660
ISN 0425           STEMP2(IKM)=FSPO                                                 00004670
ISN 0426           STEMP3(IKM)=SK                                                   00004680
ISN 0427      1033 STEMP1(IKM)=SK                                                   00004690
ISN 0428           KKSP(1,KKONT)=II(IKM)                                            00004700
ISN 0429           KKSP(2,KKONT)=MM(IKM)                                            00004710
ISN 0430           KKSP(3,KKONT)=KK(IKM)                                            00004720
ISN 0431           KKSP(4,KKONT)=4                                                  00004730
ISN 0432           JBS(IKM)=4                                                       00004740
ISN 0433      1040 SCP(IKM)=SK                                                      00004750
ISN 0434           FSPOP(IKM)=FSPO                                                  00004760
ISN 0435           OLDELG = DELG(IKM)                                               00004770
ISN 0436           DELG(IKM) = FSPO*GFLEX(IKM)                                      00004780
ISN 0437           DELG(IKM) = AMAX1(OLDELG,DELG(IKM))                              00004790
ISN 0438           FSPRNG(IKM,1) = FSPO                                             00004800
ISN 0439           FSPRNG(IKM,8)=FSPD                                               00004810
              C    CALCULATE FPLOW(TIME)                                            00004820
ISN 0440           FPLOW = XMAX(IKM)                                                00004830
ISN 0441           IF(TIME.GE.PLOWT) FPLOW=0.                                       00004840
              C    CHECK TO SEE IF SPRING IS ON SLOPE OR BETA = 0.                  00004850
ISN 0443           IF(VCINT(K)) 191,191,180                                         00004860
ISN 0444       180 IF(BETA.EQ.0.) GO TO 191                                         00004870
              C    GET 3 COMPONENTS OF FSPO IN GROUND AXES                          00004880
ISN 0446           XVOC(1,K) = AI(3*K-2)*FSPO                                       00004890
ISN 0447           XVOC(2,K) = AI(3*K-1)*FSPO                                       00004900
ISN 0448           XVOC(3,K) = AI(3*K)*FSPO                                         00004910
ISN 0449           XVOC(1,K) = XVOC(1,K)*SIGN(ONE,XXLBAR(K))                        00004920
ISN 0450           XVOC(2,K) = XVOC(2,K)*SIGN(ONE,XXLBAR(K))                        00004930
ISN 0451           XVOC(3,K) = XVOC(3,K)*SIGN(ONE,XXLBAR(K))                        00004940
              C    CONVERT TO SLOPE AXES,GETTING Z COMPONENT ONLY                   00004950
ISN 0452           XVOCSL(3,K) = SINBET*XVOC(1,K)+COSBET*XVOC(3,K)                  00004960
              C    CALCULATE X AND Y COMPONENTS IN SLOPE AXES FROM GROUND FRICTION  00004970
              C    AND VELOCITY DIRECTION                                           00004980
ISN 0453           V1 = VEEDOT(1,K)                                                 00004990
ISN 0454           V2 = VEEDOT(2,K)                                                 00005000
ISN 0455           VBB = SQRT(V1*V1+V2*V2)                                          00005010
ISN 0456           IF(VBB) 183,183,182                                              00005020
ISN 0457       183 VX=0.                                                            00005030
ISN 0458           GO TO 184                                                        00005040
ISN 0459       182 VX = XMU(IKM)*XVOCSL(3,K)/VBB+FPLOW/VBB                          00005050
ISN 0460       184 XVOCSL(1,K) = VX*VEEDOT(1,K)                                     00005060
ISN 0461           XVOCSL(2,K) = VX*VEEDOT(2,K)                                     00005070
ISN 0462           IF(SYMFLG.NE.0.AND.YDP(I).EQ.0.) XVOCSL(2,K) = 0.                00005080
ISN 0464           FSPRNG(IKM,2) = XVOCSL(1,K)                                      00005090
ISN 0465           FSPRNG(IKM,3) = XVOCSL(2,K)                                      00005100
ISN 0466           FSPRNG(IKM,4) = XVOCSL(3,K)                                      00005110
              C    NOW TRANSFORM BACK TO GROUND AXES TO REJOIN BASIC CODING          00005120
              C    FROM HERE ON SEPARATE LOADS NORMAL TO SURFACE AND FRICTION LOADS 00005130
              C    TO CALCULATE CRUSHING ENERGY AND FRICTION ENERGY                 00005140
ISN 0467       181 XVOCB(1,K) = SINBET*XVOCSL(3,K)                                  00005150
ISN 0468           XVOCB(2,K) = 0.                                                  00005160
ISN 0469           XVOCB(3,K) = COSBET*XVOCSL(3,K)                                  00005170
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ISN 0470          XVOCF(1,K) = COSBET*XVOCSL(1,K)
ISN 0471          XVOCF(2,K) = XVCCSL(2,K)
ISN 0472          XVOCF(3,K) =-SINBET*XVOCSL(1,K)
ISN 0473          GO TO 210
            C (15A)
ISN 0474      191 VX = AI(3*K)*FSPO
ISN 0475          VX = VX*SIGN(ONE,XXLBAR(K))
ISN 0476          XVOC(3,K) = VX
ISN 0477          V1 = VEEDOT(1,K)
ISN 0478          V2 = VEEDOT(2,K)
ISN 0479          VBB = SQRT(V1*V1+V2*V2)
ISN 0480          IF(VBB) 201,201,200
ISN 0481      201 VX=0.
ISN 0482          GO TO 202
ISN 0483      200 VX = XMU(IKM)*VX/VBB+FPLOW/VBB
ISN 0484      202 XVOCB(1,K) = 0.
ISN 0485          XVOCB(2,K) = 0.
ISN 0486          XVOCB(3,K) = XVOC(3,K)
ISN 0487          XVOCF(3,K) = 0.
ISN 0488          XVOCF(1,K) = VX*VEEDOT(1,K)
ISN 0489          XVOCF(2,K) = VX*VEEDOT(2,K)
ISN 0490          IF(SYMFLG.NE.0.AND.YDP(I).EQ.0.) XVOCF(2,K) = 0.
ISN 0492          FSPRNG(IKM,2) = XVOCF(1,K)
ISN 0493          FSPRNG(IKM,3) = XVOCF(2,K)
ISN 0494          FSPRNG(IKM,4) = XVOCB(3,K)
ISN 0495      210 IF(BARL) 355,360,360
ISN 0496      355 T = -BARL-SK+DELG(IKM)
ISN 0497          T = -T
ISN 0498          GO TO 365
ISN 0499      360 T = BARL-SK+DELG(IKM)
ISN 0500      365 XLNGTH(K) = T
ISN 0501          IS = 0
            C LOOP Q
ISN 0502          DO 220 J = 1,3
ISN 0503          SUMB = 0.
ISN 0504          SUMF = 0.
            C LOOP R
ISN 0505          DO 230 L = 1,3
ISN 0506          IS = IS+1
ISN 0507          SUMB = SUMB-AI(IS)*XVOCB(L,K)
ISN 0508      230 SUMF = SUMF-AI(IS)*XVOCF(L,K)
ISN 0509          FSPB(J,K) = SUMB
ISN 0510          FSPF(J,K) = SUMF
ISN 0511          FSP(J,K) = SUMB+SUMF
ISN 0512          FSPRNG(IKM,(J+4)) = FSP(J,K)
ISN 0513      220 CONTINUE
            C END OF LOOP N
ISN 0514      105 CONTINUE
            C CRASH FORCES
ISN 0515          DO 240 J = 1,3
ISN 0516          SUM = 0.0
ISN 0517          DO 250 K = 1,3
ISN 0518      250 SUM = SUM+FSP(J,K)
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ISN 0519          XXC(J) = SUM
ISN 0520      240 CONTINUE
             C    DXYZ(1) = DX(I)
             C    DXYZ(2) = DY(I)
             C    DXYZ(3) = DZ(I)
ISN 0521          DXYZ(1) = VADOT(1)*DELTAT
ISN 0522          DXYZ(2) = VADOT(2)*DELTAT
ISN 0523          DXYZ(3) = VADOT(3)*DELTAT
             C    DPQRIN(1) = DQIN(I)
             C    DPQRIN(2) = DRIN(I)
             C    DPQRIN(3) = DPIN(I)
             C    DPQRIN(4) = DQIN(I)
ISN 0524          DPQRIN(1) = PBAR(2)*DELTAT
ISN 0525          DPQRIN(2) = PBAR(3)*DELTAT
ISN 0526          DPQRIN(3) = PBAR(1)*DELTAT
ISN 0527          DPQRIN(4) = PBAR(2)*DELTAT
ISN 0528          TERM(1) = FSPB(3,1)*(XLNGTH(1)+RRX)
ISN 0529          TERM(2) = FSPB(1,2)*(XLNGTH(2)+RRY)
ISN 0530          TERM(3) = FSPB(2,3)*(XLNGTH(3)+RRZ)
ISN 0531          TERM(4) = FSPB(2,1)*(XLNGTH(1)+RRX)
ISN 0532          TERM(5) = FSPB(3,2)*(XLNGTH(2)+RRY)
ISN 0533          TERM(6) = FSPB(1,3)*(XLNGTH(3)+RRZ)
ISN 0534          TERMF(1) = FSPF(3,1)*(XLNGTH(1)+RRX)
ISN 0535          TERMF(2) = FSPF(1,2)*(XLNGTH(2)+RRY)
ISN 0536          TERMF(3) = FSPF(2,3)*(XLNGTH(3)+RRZ)
ISN 0537          TERMF(4) = FSPF(2,1)*(XLNGTH(1)+RRX)
ISN 0538          TERMF(5) = FSPF(3,2)*(XLNGTH(2)+RRY)
ISN 0539          TERMF(6) = FSPF(1,3)*(XLNGTH(3)+RRZ)
             C CRASH MOMENTS
ISN 0540          XXC(4) = TERM(5)+TERMF(5)-TERM(3)-TERMF(3)
ISN 0541          XXC(5) = TERM(6)+TERMF(6)-TERM(1)-TERMF(1)
ISN 0542          XXC(6) = TERM(4)+TERMF(4)-TERM(2)-TERMF(2)
ISN 0543          IF(M.EQ.0) GO TO 2001
             C
             C    IF WE ARE AT A NODE POINT, WE MUST CALCULATE ADDITIONAL
             C    MOMENT CONTRIBUTIONS TO XXC(4-6).
             C
ISN 0545          RTERM(1) = RRX*(FSPB(3,2)+FSPB(3,3))
ISN 0546          RTERM(2) = RRY*(FSPB(1,1)+FSPB(1,3))
ISN 0547          RTERM(3) = RRZ*(FSPB(2,1)+FSPB(2,2))
ISN 0548          RTERM(4) = RRX*(FSPB(2,2)+FSPB(2,3))
ISN 0549          RTERM(5) = RRY*(FSPB(3,1)+FSPB(3,3))
ISN 0550          RTERM(6) = RRZ*(FSPB(1,1)+FSPB(1,2))
ISN 0551          RTERMF(1) = RRX*(FSPF(3,2)+FSPF(3,3))
ISN 0552          RTERMF(2) = RRY*(FSPF(1,1)+FSPF(1,3))
ISN 0553          RTERMF(3) = RRZ*(FSPF(2,1)+FSPF(2,2))
ISN 0554          RTERMF(4) = RRX*(FSPF(2,2)+FSPF(2,3))
ISN 0555          RTERMF(5) = RRY*(FSPF(3,1)+FSPF(3,3))
ISN 0556          RTERMF(6) = RRZ*(FSPF(1,1)+FSPF(1,2))
ISN 0557          XXC(4) = XXC(4)+RTERM(5)+RTERMF(5)-RTERM(3)-RTERMF(3)
ISN 0558          XXC(5) = XXC(5)+RTERM(6)+RTERMF(6)-RTERM(1)-RTERMF(1)
ISN 0559          XXC(6) = XXC(6)+RTERM(4)+RTERMF(4)-RTERM(2)-RTERMF(2)
ISN 0560          ETERM(1) = RRY*DPQRIN(2)-RRZ*DPQRIN(1)
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ISN 0561          ETERM(2) = RRZ*DPQRIN(3)-RRX*DPQRIN(2)                         00006240
ISN 0562          ETERM(3) = RRX*DPQRIN(1)-RRY*DPQRIN(3)                         00006250
ISN 0563          ETB(1) = DPQRIN(3)*(RRY*FSPB(3,1)-RRZ*FSPB(2,1))               00006260
ISN 0564          ETB(2) = DPQRIN(1)*(RRZ*FSPB(1,2)-RRX*FSPB(3,2))               00006270
ISN 0565          ETB(3) = DPQRIN(2)*(RRX*FSPB(2,3)-RRY*FSPB(1,3))               00006280
ISN 0566          ETF(1) = DPQRIN(3)*(RRY*FSPF(3,1)-RRZ*FSPF(2,1))               00006290
ISN 0567          ETF(2) = DPQRIN(1)*(RRZ*FSPF(1,2)-RRX*FSPF(3,2))               00006300
ISN 0568          ETF(3) = DPQRIN(2)*(RRX*FSPF(2,3)-RRY*FSPF(1,3))               00006310
            C                                                                    00006320
            C     FOR SYMMETRICAL CASE,CENTERLINE MASSES,FORCE Y,L,N LOADS TO ZERO 00006330
            C                                                                    00006340
ISN 0569     2001 IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 2010                     00006350
ISN 0571          XXC(2) = 0.                                                    00006360
ISN 0572          XXC(4) = 0.                                                    00006370
ISN 0573          XXC(6) = 0.                                                    00006380
ISN 0574          IF(M.EQ.0.OR.SYMFLG.EQ.2.) GO TO 2010                          00006390
ISN 0576          DO 2002 JJ=1,NNP                                               00006400
ISN 0577          IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2004                   00006410
ISN 0579     2002 CONTINUE                                                       00006420
ISN 0580     2004 IF(YNPDP(JJ).EQ.0.) GO TO 2010                                 00006430
            C                                                                    00006440
            C     IF WE HAVE A SYMMETRIC CASE,CL MASS,AND NON-CL NODE POINT,     00006450
            C     WE MUST DOUBLE X,Z AND M LOADS ON MASS I DUE TO THE EXTERNAL   00006460
            C     SPRING ON THE OPPOSITE SIDE NODE POINT.                        00006470
            C                                                                    00006480
ISN 0582          XXC(1) = 2.*XXC(1)                                             00006490
ISN 0583          XXC(3) = 2.*XXC(3)                                             00006500
ISN 0584          XXC(5) = 2.*XXC(5)                                             00006510
            C                                                                    00006520
            C     WE ARE STILL IN AN M (NODE POINT) LOOP. NOW SUM UP ALL THE     00006530
            C     EXTERNAL SPRING FORCES AND MOMENTS ACTING AT MASS I DUE TO     00006540
            C     EACH OF THE KOUNT NODE POINTS M.                               00006550
            C                                                                    00006560
ISN 0585     2010 DO 2020 J=1,6                                                  00006570
ISN 0586          XC(J) = XC(J)+XXC(J)                                           00006580
ISN 0587     2020 CONTINUE                                                       00006590
ISN 0588          CALL MATVEC(AI,DXYZ,DXYZPR,1)                                  00006600
ISN 0589          DO 260 K = 1,3                                                 00006610
ISN 0590          IF(IISP(K).EQ.0) GO TO 260                                     00006620
ISN 0592          SUM = 0.                                                       00006630
ISN 0593          SUMF = 0.                                                      00006640
ISN 0594          DO 270 J = 1,3                                                 00006650
ISN 0595          SUM = SUM-FSPB(J,K)*DXYZPR(J)                                  00006660
ISN 0596          SUMF = SUMF-FSPF(J,K)*DXYZPR(J)                                00006670
ISN 0597      270 CONTINUE                                                       00006680
ISN 0598          SUM1 = TERM(K)*DPQRIN(K)-TERM(K+3)*DPQRIN(K+1)                 00006690
ISN 0599          SUMF1 = TERMF(K)*DPQRIN(K)-TERMF(K+3)*DPQRIN(K+1)              00006700
ISN 0600          DO 2050 IKM=1,NSP                                              00006710
ISN 0601          IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 2060  00006720
ISN 0603     2050 CONTINUE                                                       00006730
ISN 0604     2060 IF(M.EQ.0) GO TO 2030                                          00006740
ISN 0606          SUM1 = SUM1+FSPB(K,K)*ETERM(K)-ETB(K)                          00006750
ISN 0607          SUMF1 = SUMF1+FSPF(K,K)*ETERM(K)-ETF(K)                        00006760
```

```
ISN 0608      2030 CEIK(IKM) = CEIK(IKM)+SUM+SUM1                           00006770
ISN 0609           CEIKF(IKM) = CEIKF(IKM)+SUMF+SUMF1                       00006780
              C                                                             00006790
              C    FOR A SYMMETRICAL MODEL WE MUST ADD CE AND FE CONTRIBUTIONS 00006800
              C    FROM THE OPPOSITE SPRINGS THAT ARE NOT INPUT EXPLICITLY.  00006810
              C                                                             00006820
ISN 0610           IF(SYMFLG.NE.1.) GO TO 260                               00006830
ISN 0612           IF(M.EQ.0.AND.YDP(I).EQ.0.) GO TO 260                    00006840
ISN 0614           IF(M.EQ.0) GO TO 3000                                    00006850
ISN 0616           IF(YDP(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 260            00006860
ISN 0618      3000 CEIK(IKM) = CEIK(IKM)+SUM+SUM1                           00006870
ISN 0619           CEIKF(IKM) = CEIKF(IKM)+SUMF+SUMF1                       00006880
ISN 0620       260 CONTINUE                                                 00006890
ISN 0621        20 CONTINUE                                                 00006900
ISN 0622           RETURN                                                   00006910
ISN 0623           END                                                      00006920
```

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*                                                                             *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334DAIN  AT LEVEL 003 AS OF 07/19/78
  ISN 0002          SUBROUTINE DATIN(X,NAME,NWDS,UNIT,ERROR)
              C
              CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
              C                                                                  C
              C                                                                  C
              C     RETRIEVES VARIABLE AND ASSOCIATED VALUES FROM STORAGE        C
              C                                                                  C
              C     ARGS :  X     - STORAGE LOCATION WHERE VALUES RETRIEVED ARE  C
              C                     TO BE STORED                                 C
              C             NAME  - LITERAL NAME OF VARIABLE TO BE RETRIEVED     C
              C                     (8 CHAR MAX)                                 C
              C             NWDS  - NUMBER OF VALUES TO RETURN                   C
              C             UNIT  - UNIT WHERE MASTER DATA SET IS MOUNTED        C
              C             ERROR - FLAG; ERROR FLAG                             C
              C                                                                  C
              C                                                                  C
              CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
              C
  ISN 0003          INTEGER X(1),TEMP(4),RECORD(250),ERROR,UNIT,END1
  ISN 0004          DOUBLE PRECISION NAME,DUMMY,START,BLANK,END
  ISN 0005          EQUIVALENCE (DUMMY,TEMP(1)),(JWDS,TEMP(4))
  ISN 0006          DATA LRECL/250/,START/'**START*'/,BLANK/'        '/,
                   1     END/'*END*END'/, JWDS/-1/, END1/'*END'/
              C
              C  ...GET VARIABLE NAME AND NUMBER OF VALUES...
              C
  ISN 0007          ERROR = 0
  ISN 0008          IF (JWDS .GT. 0) GO TO 5
  ISN 0010            PRINT 6000
  ISN 0011            ERROR = 22
  ISN 0012            RETURN
  ISN 0013        5 DO 20 I = 1,3
  ISN 0014            IF (JWDS .LT. LRECL) GO TO 10
  ISN 0016              READ (UNIT,END=99) RECORD
  ISN 0017              JWDS = 0
  ISN 0018       10   JWDS = JWDS +1
  ISN 0019       20   TEMP(I) = RECORD(JWDS)
              C
              C     ...CHECK IF END OF DATA...
              C
```

```
ISN 0020          IF (DUMMY .NE. END) GO TO 30
ISN 0022            PRINT 1000,NAME
ISN 0023            JWDS = JWDS - 3
ISN 0024            ERROR = 25
ISN 0025            RETURN
             C
ISN 0026       30 IF (NAME .EQ. BLANK) NAME = DUMMY
             C
             C    ...GET VALUES...
             C
ISN 0028       40 NREC = TEMP(3)
ISN 0029          NSTORE = NREC
ISN 0030          IF (NREC .GT. NWDS) NSTORE = NWDS
ISN 0032          IF (NAME .NE. DUMMY) NSTORE = 0
ISN 0034          IF (NREC .LE. 0)  GO TO 70
ISN 0036          DO 60 I=1,NREC
ISN 0037            IF (JWDS .LT. LRECL) GO TO 50
ISN 0039              READ (UNIT,END=99) RECORD
ISN 0040              JWDS = 0
ISN 0041       50   JWDS = JWDS +1
ISN 0042            IF (I .LE. NSTORE) X(I) = RECORD(JWDS)
ISN 0044       60 CONTINUE
ISN 0045       70 ERROR = -NSTORE
ISN 0046          RETURN
ISN 0047       99 ERROR = 20
ISN 0048          PRINT 3000,NAME
ISN 0049          RETURN
             C
             C
             C ...READ HEADER...
             C
             C
             C
ISN 0050          ENTRY OPNIN(HEADER,NWDS,UNIT,ERROR)
ISN 0051          INTEGER HEADER(1)
ISN 0052          ERROR = 0
ISN 0053          JWDS = 3
ISN 0054      100 READ (UNIT,END=199) RECORD
ISN 0055          TEMP(1) = RECORD(1)
ISN 0056          TEMP(2) = RECORD(2)
ISN 0057          IF (DUMMY .NE. START) GO TO 100
ISN 0059          NREC = RECORD(3)
ISN 0060          IF (NREC .LT. 1) RETURN
ISN 0062          DO 120 I = 1,NREC
ISN 0063            JWDS = JWDS +1
ISN 0064            IF (I .LE. NWDS) HEADER(I) = RECORD(JWDS)
ISN 0066      120 CONTINUE
ISN 0067          RETURN
ISN 0068      199 CONTINUE
ISN 0069          ERROR = 10
ISN 0070          PRINT 4000
ISN 0071          RETURN
             C
```

```
                C
                C  ...POSITION TO END OF DATA SET...
                C
                C
ISN 0072              ENTRY CLSIN(UNIT,ERROR)
ISN 0073              JWDS = -1
ISN 0074              ERROR = 0
ISN 0075          200 IF (RECORD(LRECL) .EQ. END1) RETURN
ISN 0077              READ (UNIT,END=299) RECORD
ISN 0078              GO TO 200
ISN 0079          299 CONTINUE
ISN 0080              ERROR = 30
ISN 0081              PRINT 5000
ISN 0082              RETURN
                C
                C  ...FORMATS...
                C
ISN 0083         1000 FORMAT(1H0,10X,'11. ****ERROR - END OF DATA REACHED AT',
                    1                ' VARIABLE ',A8,'****')
ISN 0084         3000 FORMAT(1H0,10X,'12. ****ERROR - END OF FILE REACHED AT',
                    1                ' VARIABLE ',A8,'****')
ISN 0085         4000 FORMAT(1H0,10X,'13. ****ERROR - END OF FILE REACHED TRYING TO',
                    1                ' OPEN DATA SET FOR READING****')
ISN 0086         5000 FORMAT(1H0,10X,'14. ****ERROR - EOF TRYING TO CLOSE DATA SET',
                    1                ' AFTER READING****')
ISN 0087         6000 FORMAT(1H0,10X,'15. ****ERROR - CANNOT READ DATA WITHOUT',
                    1                ' FIRST OPENING DESIRED DATA SET****')
ISN 0088              END
```

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    COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C         DATA SET D2334DAOUT AT LEVEL 008 AS OF 03/23/79
               C         DATA SET D2332ZDATO AT LEVEL 007 AS OF 07/19/78
               C         INCREASE NUMBER OF BACKSPACES TO 5.  3-20-79 WJL
ISN 0002              SUBROUTINE DATOUT(X,NAME,NWDS,UNIT,ERROR)
ISN 0003              DIMENSION X(1),TEMP(4),RECORD(250)
ISN 0004              INTEGER X,UNIT,ERROR,TEMP,RECORD
ISN 0005              DOUBLE PRECISION NAME,DUMMY
ISN 0006              EQUIVALENCE (DUMMY,TEMP(1)),(JWDS,TEMP(4))
ISN 0007              DATA LRECL/250/, JWDS/-1/
               C
               C   ...WRITE VARIABLE DEFINITION DATA...
               C
ISN 0008              IF (JWDS .GT. 0) GO TO 10
ISN 0010                 PRINT 1000
ISN 0011                 ERROR = 42
ISN 0012                 RETURN
ISN 0013           10 IF (NWDS .LT. 1000000) GO TO 15
ISN 0015                 PRINT 2000,NWDS
ISN 0016                 ERROR = 47
ISN 0017                 RETURN
ISN 0018           15 DUMMY = NAME
ISN 0019              TEMP(3) = NWDS
ISN 0020              ERROR = 0
ISN 0021              DO 30 I = 1,3
ISN 0022                IF (JWDS .LT. LRECL) GO TO 20
ISN 0024                  WRITE (UNIT) RECORD
ISN 0025                  JWDS = 0
ISN 0026           20   JWDS = JWDS +1
ISN 0027           30   RECORD(JWDS) = TEMP(I)
ISN 0028              IF (NWDS .LE. 0) RETURN
               C
               C      ...WRITE VARIABLE VALUES...
               C
ISN 0030              DO 60 I = 1,NWDS
ISN 0031                IF (JWDS .LT. LRECL) GO TO 50
ISN 0033                  WRITE (UNIT) RECORD
ISN 0034                  JWDS = 0
ISN 0035           50   JWDS = JWDS +1
ISN 0036           60   RECORD(JWDS) = X(I)
ISN 0037              RETURN
               C
```

```
              C
              C  ...WRITING HEADER INFORMATION...
              C
              C
ISN 0038            ENTRY OPNOUT(UNIT)
ISN 0039            INTEGER DSN(1),DATE(5)
ISN 0040            INTEGER ACCARD(22) /22*0/
ISN 0041            INTEGER HEAD(3)/'**ST','ART*','*END'/
              C
              C     ...FIND LAST RECORD WRITTEN...
              C
ISN 0042        100 READ (UNIT,END=105)
ISN 0043            GO TO 100
ISN 0044        105 CONTINUE
              C
              C       TAPE IS BACKSPACED TWICE TO POSITION TAPE HEAD AT BEGINNING
              C       OF LAST RECORD.
              C
ISN 0045            DO 106 J=1,2
ISN 0046            BACKSPACE UNIT
ISN 0047        106 CONTINUE   .
              C
              C       LAST RECORD IS READ AGAIN, TO POSITION TAPE FOR NEXT WRITE,
              C       WHICH WILL DESTROY EOF TAPE MARK.
              C
ISN 0048            READ(21) RECORD
              C
              C     ...WRITE HEADER...
              C
ISN 0049            DO 107  I=1,22
ISN 0050        107   ACCARD(I) = 0
ISN 0051            RECORD(1) = HEAD(1)
ISN 0052            RECORD(2) = HEAD(2)
ISN 0053            CALL CDATE(DATE,0)
ISN 0054            RECORD(3) = 24
ISN 0055            RECORD(4) = DATE(1)
ISN 0056            RECORD(5) = DATE(2)
ISN 0057            CALL JOBAC(ACCARD)
ISN 0058            DO 110 I = 1,22
ISN 0059              JWDS = I + 5
ISN 0060       110    RECORD(JWDS) = ACCARD(I)
ISN 0061            RETURN
              C
              C
              C  ...WRITE CLOSING INFORMATION...
              C
              C
ISN 0062            ENTRY CLSOUT(UNIT)
ISN 0063            IF (JWDS .LT. LRECL) GO TO 200
ISN 0065              WRITE (UNIT) RECORD
ISN 0066              JWDS = 0
ISN 0067       200  JWDS = JWDS +1
ISN 0068            DO 210 I = JWDS, LRECL
```

```
ISN 0069      210    RECORD(I) = HEAD(3)
ISN 0070           WRITE (UNIT) RECORD
             C
             C          TAPE FILE IS ENDED, THEN BACKSPACED TWICE TO POSITION
             C            TAPE HEAD TO BEGINNING OF LAST RECORD.  THAT RECORD IS
             C            THEN READ, AND NEXT READ WILL ENCOUNTER EOF.
             C
ISN 0071           END FILE UNIT
ISN 0072           DO 215 J=1,2
ISN 0073           BACKSPACE UNIT
ISN 0074       215 CONTINUE
ISN 0075           READ(21) RECORD
ISN 0076           JWDS = -1
ISN 0077           RETURN
ISN 0078      1000 FORMAT(1H0,10X,'16. ****ERROR - MUST OPEN DATA SET BEFORE',
                  1            'WRITING DATA OUT****')
ISN 0079      2000 FORMAT(1H0,10X,'17. **WARNING - REQUESTED STORING ',I9,
                  1            ' VALUES.  STORE FAILED**')
ISN 0080           END
```

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*                                                                                    *
*                                                                                    *
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       COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                              SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                 C          DATA SET D2334DERIV AT LEVEL 010 AS OF 06/25/79
                 C          DATA SET D2332VDE   AT LEVEL 009 AS OF 02/09/78
  ISN 0002             SUBROUTINE DERIV
                 C
                 C     DELTAVB/DELTAT VERSION
                 C
  ISN 0003             IMPLICIT REAL*8 (A-H,O-Z)
  ISN 0004             REAL*8 KETOTL,KEI
  ISN 0005             REAL*8 KUN,KR(6)
  ISN 0006             REAL*8 MX,MY,MZ,MYI,MYJ,MZI,MZJ,MINDT
  ISN 0007             REAL*4 XKS,XKI,XKR,AXK,PTR,CLTEST
  ISN 0008             INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)
  ISN 0009             INTEGER*4 TITLE(40),BPL(100,3)
  ISN 0010             INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)
  ISN 0011             INTEGER*2 NLSFLG,CHUG,N1,IJPR,NN
  ISN 0012             INTEGER*2 INBUFF,IG,JG
  ISN 0013             INTEGER*2 MG(150),NG(150),INP(50),MNP(50),II(40),KK(40),MM(40)
  ISN 0014             DIMENSION IRUPSW(150),IPENSW(80),SINCOS(6),CIJ(720),DAI(9),
                      1 D(9),AIAIJT(9),AP(9)
  ISN 0015             DIMENSION VBOT(6),FEE(900)
  ISN 0016             DIMENSION XVOL(6,3),VOLLEN(5,3)
  ISN 0017             DIMENSION SS(4),SAX(4)
  ISN 0018             DIMENSION RX(50),RY(50),RZ(50),UNP(50),VNP(50),WNP(50)
  ISN 0019             DIMENSION XNP(50),YNP(50),ZNP(50),DXNP(50),DYNP(50),DZNP(50)
  ISN 0020             DIMENSION XDNP(50),YDNP(50),ZDNP(50)
  ISN 0021             DIMENSION XACCNP(50),YACCNP(50),ZACCNP(50)
  ISN 0022             DIMENSION XNPOLD(50),YNPOLD(50),ZNPOLD(50)
  ISN 0023             DIMENSION FDI(6),FSI(6),VJ(6),VI(6),VEL(9),
                      1          VEEBAR(900),DPHIIJ(150)
  ISN 0024             DIMENSION TEMP(9),SUMM(9),AIJTAJ(9),AIJTAI(9),DJ(6),DI(6),
                      1          DFJ(6),DFI(6),FSJ(6),FDJ(6)
  ISN 0025             COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
                      1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
                      2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
                      3 MVP
  ISN 0026             COMMON/DOIN/ CBAR(150)
  ISN 0027             COMMON/DEIR/ PLM26(150),PLM35(150),PLM26J(150),PLM35J(150)
  ISN 0028             COMMON/DEMA/ DEVMAX
  ISN 0029             COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),
                      1             FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)
  ISN 0030             COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),
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                1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),      00000410
                2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                       00000420
ISN 0031          COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),      00000430
                1                XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,      00000440
                2                PETOTL,SETOTL,DETOTL,CETOTL,FETOTL                  00000450
ISN 0032          COMMON/MADE/KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,         00000460
                1 TPL(100),BPL,KPL                                                   00000470
ISN 0033          COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),        00000480
                1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)            00000490
ISN 0034          COMMON/INDEAC/ NACC                                                00000500
ISN 0035          COMMON/INIDCP/ YDP(80)                                             00000510
ISN 0036          COMMON/INPR/ NDRI,NSP                                              00000520
ISN 0037          COMMON                   XX(80),XY(80),XZ(80),XL(80),XM(80),       00000530
                1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),    00000540
                2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),   00000550
                5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),             00000560
                6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),    00000570
                7 PHIOLD(80),THEOLD(80),PSIOLD(80),                                  00000580
                8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),    00000590
                9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),    00000600
                A TKR(200),TPEN(80),DTHALF,                                          00000610
                B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT                     00000620
ISN 0038          COMMON/MCFIII/ SYMFLG                                              00000630
ISN 0039          COMMON/NP00I2/ MG,NG,INP,MNP                                       00000640
ISN 0040          COMMON/NP01I2/ II,KK,MM                                            00000650
ISN 0041          COMMON/NP00I4/ NNP                                                 00000660
ISN 0042          COMMON/NP00R8/ RX,RY,RZ                                            00000670
ISN 0043          COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,             00000680
                1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                          00000690
ISN 0044          COMMON/DEIC/ WTOT,CLTEST(150)                                      00000700
ISN 0045          COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),         00000710
                1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),     00000720
                2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO           00000730
ISN 0046          COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),     00000740
                1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),       00000750
                2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),            00000760
                3 YIMNPL(50),ZIMNPL(50)                                              00000770
ISN 0047          COMMON/IRDE/ PFIL                                                  00000780
ISN 0048          COMMON/UB/ DB(150),IJUB(150),NUB                                   00000790
ISN 0049          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000800
                1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),              00000810
                2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),             00000820
                3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),      00000830
                4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),    00000840
                5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,    00000850
                6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                               00000860
                7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,               00000870
                8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),             00000880
                9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),           00000890
                A CEIKF(40),                                                         00000900
                B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                              00000910
                C NM,NB,I,J,IG(150),JG(150),                                         00000920
                D N1(900),NN(40),IJPR(150)                                           00000930
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```
ISN 0050          COMMON /MAX/ IRUPSW(150),IPENSW(80),VEEBAR(900),ZINIT(80),          00000940
                 1              DPHIIJ(150),FUB(150)                                     00000950
ISN 0051          COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR      00000960
ISN 0052          COMMON /MACFIN/ TMAX,IPRINT                                        00000970
ISN 0053          EQUIVALENCE (S1,SINCOS(1)),(C1,SINCOS(2)),(S2,SINCOS(3)),          00000980
                 1              (C2,SINCOS(4)),(S3,SINCOS(5)),(C3,SINCOS(6))     00000990
ISN 0054          SQRT(X) = DSQRT(X)                                                 00001000
ISN 0055          SIN(X) = DSIN(X)                                                   00001010
ISN 0056          COS(X) = DCOS(X)                                                   00001020
ISN 0057          SIGN(X1,X2) = DSIGN(X1,X2)                                         00001030
ISN 0058          ABS(X) = DABS(X)                                                   00001040
ISN 0059          AMAX1(X,Y) = DMAX1(X,Y)                                            00001050
ISN 0060          ATAN2(Y,X) = DATAN2(Y,X)                                           00001060
ISN 0061          TANH(X)=DTANH(X)                                                   00001070
ISN 0062          ONE = 1.                                                           00001080
ISN 0063          TT = .2                                                            00001090
ISN 0064          ET = .8                                                            00001100
ISN 0065          S = DELTAT                                                         00001110
ISN 0066          PI2 = 3.14159265358979324D0/2.                                     00001120
ISN 0067          ERR = 0.                                                           00001130
ISN 0068          IF(TIME.NE.0.0) GO TO 60                                           00001140
ISN 0070          DO 70 IJ = 1,NB                                                    00001150
ISN 0071          PHIIJ(IJ) = 0.                                                     00001160
ISN 0072          DPHIIJ(IJ) = 0.                                                    00001170
ISN 0073          VEEN(1,IJ) = 0.                                                    00001180
ISN 0074          VEEN(2,IJ) = 0.                                                    00001190
ISN 0075          DO 71 K=1,6                                                        00001200
ISN 0076       71 SUMDFI(K,IJ) = 0.                                                  00001210
ISN 0077       70 IRUPSW(IJ) = 0                                                     00001220
ISN 0078          DO 72 I=1,NM                                                       00001230
ISN 0079          XSE(I) = 0.                                                        00001240
ISN 0080          XDE(I) = 0.                                                        00001250
ISN 0081       72 IPENSW(I)=0                                                        00001260
ISN 0082          NB9 = 9*NB                                                         00001270
ISN 0083          DO 74 I = 1,NB9                                                    00001280
ISN 0084          VEEBAR(I) = 0.                                                     00001290
ISN 0085       74 CONTINUE                                                           00001300
               C DO ALL THE (AI)((AJ))                                               00001310
ISN 0086       60 DO 10 I = 1,NM                                                     00001320
ISN 0087          ARG = PHI(I)                                                       00001330
ISN 0088          S1 = SIN(ARG)                                                      00001340
ISN 0089          C1 = COS(ARG)                                                      00001350
ISN 0090          ARG = THETA(I)                                                     00001360
ISN 0091          S2 = SIN(ARG)                                                      00001370
ISN 0092          C2 = COS(ARG)                                                      00001380
ISN 0093          ARG = PSI(I)                                                       00001390
ISN 0094          S3 = SIN(ARG)                                                      00001400
ISN 0095          C3 = COS(ARG)                                                      00001410
ISN 0096          DO 40 J = 1,6                                                      00001420
ISN 0097          T = SINCOS(J)                                                      00001430
ISN 0098          IF(T) 45,40,50                                                     00001440
ISN 0099       45 T = -T                                                             00001450
ISN 0100       50 IF(T-1.E-10) 55,40,40                                              00001460
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ISN 0101        55 SINCOS(J) = 0.0
ISN 0102        40 CONTINUE
             C
ISN 0103           J = 9*(I-1)
             C MOVE AI S TO OLD AI S
ISN 0104           DO 4 J1 = 1,9
ISN 0105         4 OAI(J+J1) = BIJ(J+J1)
ISN 0106           S1S2 = S1*S2
ISN 0107           C1S2 = C1*S2
ISN 0108           AI(1) = C2*C3
ISN 0109           BIJ(J+1) = AI(1)
ISN 0110           AI(2) = C2*S3
ISN 0111           BIJ(J+2) = AI(2)
ISN 0112           AI(3) = -S2
ISN 0113           BIJ(J+3) = AI(3)
ISN 0114           AI(4) = -C1*S3+S1S2*C3
ISN 0115           BIJ(J+4) = AI(4)
ISN 0116           AI(5) = C1*C3+S1S2*S3
ISN 0117           BIJ(J+5) = AI(5)
ISN 0118           AI(6) = S1*C2
ISN 0119           BIJ(J+6) = AI(6)
ISN 0120           AI(7) = S1*S3+C1S2*C3
ISN 0121           BIJ(J+7) = AI(7)
ISN 0122           AI(8) = -S1*C3+C1S2*S3
ISN 0123           BIJ(J+8) = AI(8)
ISN 0124           AI(9) = C1*C2
ISN 0125           BIJ(J+9) = AI(9)
             C (27)
ISN 0126           PP = P(I)
ISN 0127           QQ = Q(I)
ISN 0128           RR = R(I)
ISN 0129           UU = U(I)
ISN 0130           VV = V(I)
ISN 0131           WW = W(I)
ISN 0132           XDOT(I) = AI(1)*UU+AI(4)*VV+AI(7)*WW
ISN 0133           YDOT(I) = AI(2)*UU+AI(5)*VV+AI(8)*WW
ISN 0134           ZDOT(I) = AI(3)*UU+AI(6)*VV+AI(9)*WW
             C (28),(29)
ISN 0135           CS = S1/C2
ISN 0136           CC = C1/C2
ISN 0137           PHIDOT(I) = PP+QQ*CS*S2+RR*CC*S2
ISN 0138           THEDOT(I) = QQ*C1-RR*S1
ISN 0139           PSIDOT(I) = QQ*CS+RR*CC
             C DO AIDOT NOW
ISN 0140           T = PSIDOT(I)*C2
ISN 0141           T1 = THEDOT(I)*S1-T*C1
ISN 0142           T2 = THEDOT(I)*C1+T*S1
ISN 0143           T3 = PHIDOT(I)-PSIDOT(I)*S2
ISN 0144           CIJ(J+1)= -BIJ(J+4)*T1-BIJ(J+7)*T2
ISN 0145           CIJ(J+4)=  BIJ(J+1)*T1+BIJ(J+7)*T3
ISN 0146           CIJ(J+7)=  BIJ(J+1)*T2-BIJ(J+4)*T3
ISN 0147           CIJ(J+2)= -BIJ(J+5)*T1-BIJ(J+8)*T2
ISN 0148           CIJ(J+5)=  BIJ(J+2)*T1+BIJ(J+8)*T3
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ISN 0149          CIJ(J+8)=  BIJ(J+2)*T2-BIJ(J+5)*T3                          00002000
ISN 0150          CIJ(J+3)= -BIJ(J+6)*T1-BIJ(J+9)*T2                          00002010
ISN 0151          CIJ(J+6)=  BIJ(J+3)*T1+BIJ(J+9)*T3                          00002020
ISN 0152          CIJ(J+9)=  BIJ(J+3)*T2-BIJ(J+6)*T3                          00002030
ISN 0153       10 CONTINUE                                                    00002040
            C                                                                 00002050
            C     THE FOLLOWING CODING GETS THE VEHICLE C.G. TRANSLATIONAL    00002060
            C     VELOCITY IN GROUND AXES BY EQUATING THE VEHICLE LINEAR      00002070
            C     MOMENTUM WITH THE SUM OF THE MOMENTA OF ALL THE INDIVIDUAL  00002080
            C     LUMPED MASSES.                                              00002090
            C                                                                 00002100
ISN 0154          SUMWXD = 0.                                                 00002110
ISN 0155          SUMWYD = 0.                                                 00002120
ISN 0156          SUMWZD = 0.                                                 00002130
ISN 0157          SUMW = 0.                                                   00002140
ISN 0158          DO 12 I=1,NM                                                00002150
ISN 0159          SUMW = SUMW+WGT(I)                                          00002160
ISN 0160          SUMWXD = SUMWXD+WGT(I)*XDOT(I)                              00002170
ISN 0161          SUMWYD = SUMWYD+WGT(I)*YDOT(I)                              00002180
ISN 0162          SUMWZD = SUMWZD+WGT(I)*ZDOT(I)                              00002190
            C                                                                 00002200
            C     FOR A SYMMETRICAL MODEL WE MUST ADD THE MOMENTUM CONTRIBUTIONS 00002210
            C     FROM THE OPPOSITE MASSES THAT ARE NOT INPUT EXPLICITLY.     00002220
            C                                                                 00002230
ISN 0163          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 12                    00002240
ISN 0165          SUMW = SUMW+WGT(I)                                          00002250
ISN 0166          SUMWXD = SUMWXD+WGT(I)*XDOT(I)                              00002260
ISN 0167          SUMWYD = SUMWYD-WGT(I)*YDOT(I)                              00002270
ISN 0168          SUMWZD = SUMWZD+WGT(I)*ZDOT(I)                              00002280
ISN 0169       12 CONTINUE                                                    00002290
ISN 0170          XDOTAP = SUMWXD/SUMW                                        00002300
ISN 0171          YDOTAP = SUMWYD/SUMW                                        00002310
ISN 0172          ZDOTAP = SUMWZD/SUMW                                        00002320
            C                                                                 00002330
            C     FOR THE MAIN INTERNAL BEAM LOOP (DO 1000), WE NEED XNP(J),  00002340
            C     DXNP(J), AND UNP(J) FOR THE NODE POINTS.                    00002350
            C                                                                 00002360
ISN 0173          IF(NNP.EQ.0) GO TO 16                                       00002370
ISN 0175          DO 14 J=1,NNP                                               00002380
ISN 0176          XNPOLD(J) = XNP(J)                                          00002390
ISN 0177          YNPOLD(J) = YNP(J)                                          00002400
ISN 0178          ZNPOLD(J) = ZNP(J)                                          00002410
ISN 0179          I = INP(J)                                                  00002420
ISN 0180          IS = 9*(I-1)                                                00002430
ISN 0181          DO 15 KS=1,9                                                00002440
ISN 0182          IS = IS+1                                                   00002450
ISN 0183          AI(KS) = BIJ(IS)                                            00002460
ISN 0184       15 CONTINUE                                                    00002470
ISN 0185          TX = AI(1)*RX(J)+AI(4)*RY(J)+AI(7)*RZ(J)                    00002480
ISN 0186          TY = AI(2)*RX(J)+AI(5)*RY(J)+AI(8)*RZ(J)                    00002490
ISN 0187          TZ = AI(3)*RX(J)+AI(6)*RY(J)+AI(9)*RZ(J)                    00002500
ISN 0188          XNP(J) = X(I)+TX                                            00002510
ISN 0189          YNP(J) = Y(I)+TY                                            00002520
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ISN 0190          ZNP(J) = Z(I)+TZ
ISN 0191          DXNP(J) = XNP(J)-XNPOLD(J)
ISN 0192          DYNP(J) = YNP(J)-YNPOLD(J)
ISN 0193          DZNP(J) = ZNP(J)-ZNPOLD(J)
ISN 0194          OMCRX = -R(I)*RY(J)+Q(I)*RZ(J)
ISN 0195          OMCRY =  R(I)*RX(J)-P(I)*RZ(J)
ISN 0196          OMCRZ = -Q(I)*RX(J)+P(I)*RY(J)
ISN 0197          UNP(J) = U(I)+OMCRX
ISN 0198          VNP(J) = V(I)+OMCRY
ISN 0199          WNP(J) = W(I)+OMCRZ
ISN 0200          IF(TIME.NE.0.) GO TO 14
ISN 0202          DXNP(J) = 0.
ISN 0203          DYNP(J) = 0.
ISN 0204          DZNP(J) = 0.
ISN 0205       14 CONTINUE
               C
               C  ZERO OUT BEAM FORCES ON MASSES.
               C
ISN 0206       16 DO 18 I=1,NM
ISN 0207          XX(I) = 0.
ISN 0208          XY(I) = 0.
ISN 0209          XZ(I) = 0.
ISN 0210          XL(I) = 0.
ISN 0211          XM(I) = 0.
ISN 0212          XN(I) = 0.
ISN 0213       18 CONTINUE
ISN 0214          ILAST = 0
               C
               C DO 1000 IS MAIN DO LOOP TO GET TOTAL INTERNAL FORCES AND MOMENTS
               C
ISN 0215          DO 1000 IJ = 1,NB
ISN 0216          IJK = 6*(IJ-1)
ISN 0217          IF(IRUPSW(IJ).NE.0) GO TO 1000
ISN 0219          I = IG(IJ)
ISN 0220          J = JG(IJ)
ISN 0221          M = MG(IJ)
ISN 0222          N = NG(IJ)
               C IF WE GET TO A NEW I WE MUST MOVE (AI) INTO AI.
ISN 0223          IF(I-ILAST) 20,30,20
ISN 0224       20 ILAST = I
ISN 0225          IS = 9*(I-1)
ISN 0226          DO 320 KS = 1,9
ISN 0227          IS = IS+1
ISN 0228          AIDOT(KS) = CIJ(IS)
ISN 0229      320 AI(KS) = BIJ(IS)
               C
               C     NOW GET AJ.
               C
ISN 0230       30 IS = 9*(J-1)
ISN 0231          DO 3201 KS=1,9
ISN 0232          IS = IS+1
ISN 0233          IF(J.EQ.0) GO TO 3202
ISN 0235          AJ(KS) = BIJ(IS)
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ISN 0236            GO TO 3201                                                   00003060
ISN 0237       3202 AJ(KS) = AI(KS)                                              00003070
ISN 0238            IF(KS.EQ.2.OR.KS.EQ.4.OR.KS.EQ.6.OR.KS.EQ.8) AJ(KS) = -AJ(KS)   00003080
ISN 0240       3201 CONTINUE                                                     00003090
              C                                                                  00003100
              C     IF J.EQ.0,WE HAVE A SYMMETRICAL MODEL IN WHICH BEAM IJ       00003110
              C     CONNECTS NODE POINT (I,M) TO AN IMAGINARY POINT (J,N=0)      00003120
              C     LOCATED SYMMETRICALLY ACROSS THE AIRPLANE PLANE OF SYMMETRY  00003130
              C     (X-Z PLANE). FOR THESE TRANSVERSE BEAMS,THE CONDITIONS AT (J,N)  00003140
              C     ARE DEDUCED FROM THE STATE AT (I,M). J IS CHANGED TO 81 BECAUSE  00003150
              C     THE IBM 360-91 WILL NOT ACCEPT A ZERO SUBSCRIPTED VECTOR.    00003160
              C                                                                  00003170
ISN 0241            IF(J.NE.0) GO TO 3300                                        00003180
ISN 0243            J = 81                                                       00003190
ISN 0244            IF(M.NE.0) GO TO 3301                                        00003200
              C                                                                  00003210
              C     IF M.EQ.0,THERE IS NO NODE POINT AT I.                       00003220
              C                                                                  00003230
ISN 0246       3302 DXMODI = DX(I)                                               00003240
ISN 0247            DYMODI = DY(I)                                               00003250
ISN 0248            DZMODI = DZ(I)                                               00003260
ISN 0249            XMODI = X(I)                                                 00003270
ISN 0250            YMODI = Y(I)                                                 00003280
ISN 0251            ZMODI = Z(I)                                                 00003290
ISN 0252            UMODI = U(I)                                                 00003300
ISN 0253            VMODI = V(I)                                                 00003310
ISN 0254            WMODI = W(I)                                                 00003320
ISN 0255            PI = P(I)                                                    00003330
ISN 0256            QI = Q(I)                                                    00003340
ISN 0257            RI = R(I)                                                    00003350
ISN 0258            GO TO 3303                                                   00003360
              C                                                                  00003370
              C     THIS LOOP GETS NODE POINT NUMBER JI KNOWING I AND M.         00003380
              C                                                                  00003390
ISN 0259       3301 DO 3305 JI=1,NNP                                             00003400
ISN 0260            IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 3306                 00003410
ISN 0262       3305 CONTINUE                                                     00003420
ISN 0263       3306 DXMODI = DXNP(JI)                                            00003430
ISN 0264            DYMODI = DYNP(JI)                                            00003440
ISN 0265            DZMODI = DZNP(JI)                                            00003450
ISN 0266            XMODI = XNP(JI)                                              00003460
ISN 0267            YMODI = YNP(JI)                                              00003470
ISN 0268            ZMODI = ZNP(JI)                                              00003480
ISN 0269            UMODI = UNP(JI)                                              00003490
ISN 0270            VMODI = VNP(JI)                                              00003500
ISN 0271            WMODI = WNP(JI)                                              00003510
ISN 0272            PI = P(I)                                                    00003520
ISN 0273            QI = Q(I)                                                    00003530
ISN 0274            RI = R(I)                                                    00003540
ISN 0275       3303 IF(J.NE.81) GO TO 3310                                       00003550
              C                                                                  00003560
              C     IF J.EQ.81,WE HAVE A SYMMETRICAL MODEL. NOW CALCULATE        00003570
              C     CONDITIONS AT J,N BASED ON KNOWLEDGE OF STATE AT I,M.        00003580
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                 C                                                          00003590
ISN 0277               DXMODJ =  DXMODI                                     00003600
ISN 0278               DYMODJ = -DYMODI                                     00003610
ISN 0279               DZMODJ =  DZMODI                                     00003620
ISN 0280               XMODJ =  XMODI                                       00003630
ISN 0281               YMODJ = -YMODI                                       00003640
ISN 0282               ZMODJ =  ZMODI                                       00003650
ISN 0283               DPIN(J) = -DPIN(I)                                   00003660
ISN 0284               DQIN(J) =  DQIN(I)                                   00003670
ISN 0285               DRIN(J) = -DRIN(I)                                   00003680
ISN 0286               UMODJ = UMODI                                        00003690
ISN 0287               VMODJ =-VMODI                                        00003700
ISN 0288               WMODJ = WMODI                                        00003710
ISN 0289               PJ =-PI                                              00003720
ISN 0290               QJ = QI                                              00003730
ISN 0291               RJ =-RI                                              00003740
ISN 0292               GO TO 3320                                           00003750
ISN 0293          3300 IF(M.EQ.0) GO TO 3302                                00003760
ISN 0295               GO TO 3301                                           00003770
ISN 0296          3310 IF(N.NE.0) GO TO 3311                                00003780
                 C                                                          00003790
                 C     IF N.EQ.0,THERE IS NO NODE POINT AT J.               00003800
                 C                                                          00003810
ISN 0298               DXMODJ = DX(J)                                       00003820
ISN 0299               DYMODJ = DY(J)                                       00003830
ISN 0300               DZMODJ = DZ(J)                                       00003840
ISN 0301               XMODJ = X(J)                                         00003850
ISN 0302               YMODJ = Y(J)                                         00003860
ISN 0303               ZMODJ = Z(J)                                         00003870
ISN 0304               UMODJ = U(J)                                         00003880
ISN 0305               VMODJ = V(J)                                         00003890
ISN 0306               WMODJ = W(J)                                         00003900
ISN 0307               PJ = P(J)                                            00003910
ISN 0308               QJ = Q(J)                                            00003920
ISN 0309               RJ = R(J)                                            00003930
ISN 0310               GO TO 3320                                           00003940
                 C                                                          00003950
                 C     THIS LOOP GETS NODE POINT NUMBER JJ KNOWING J AND N. 00003960
                 C                                                          00003970
ISN 0311          3311 DO 3312 JJ=1,NNP                                     00003980
ISN 0312               IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 3313         00003990
ISN 0314          3312 CONTINUE                                             00004000
ISN 0315          3313 DXMODJ = DXNP(JJ)                                    00004010
ISN 0316               DYMODJ = DYNP(JJ)                                    00004020
ISN 0317               DZMODJ = DZNP(JJ)                                    00004030
ISN 0318               XMODJ = XNP(JJ)                                      00004040
ISN 0319               YMODJ = YNP(JJ)                                      00004050
ISN 0320               ZMODJ = ZNP(JJ)                                      00004060
ISN 0321               UMODJ = UNP(JJ)                                      00004070
ISN 0322               VMODJ = VNP(JJ)                                      00004080
ISN 0323               WMODJ = WNP(JJ)                                      00004090
ISN 0324               PJ = P(J)                                            00004100
ISN 0325               QJ = Q(J)                                            00004110
```

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ISN 0326           RJ = R(J)
              C
              C    ALL OF THE ABOVE PATHS LEAD TO HERE. WE NOW HAVE POSITIONS
              C    (XMOD,ETC.) AND INCREMENTAL CHANGES IN POSITIONS (DXMOD,ETC.)
              C    FOR BOTH ENDS OF BEAM IJ.
              C
ISN 0327       3320 XIJ = XMODJ-XMODI
ISN 0328           YIJ = YMODJ-YMODI
ISN 0329           ZIJ = ZMODJ-ZMODI
              C
              C CALCULATE AIJ. FIRST UPDATE PHIIJ, THEIJ, PSIIJ.
              C
ISN 0330           PHIIJ(IJ) = PHIIJ(IJ) + DPHIIJ(IJ)
ISN 0331           IF(XIJ.EQ.0.AND.YIJ.EQ.0.) GO TO 3330
ISN 0333           PSIIJ(IJ) = ATAN2(YIJ,XIJ)
ISN 0334           GO TO 3340
ISN 0335       3330 PSIIJ(IJ) = 0.
ISN 0336       3340 THEIJ(IJ) = -ATAN2(ZIJ,SQRT(XIJ*XIJ+YIJ*YIJ))
              C
              C  ZERO OUT VERY SMALL SIN AND COS TERMS.
              C
ISN 0337           ARG = PHIIJ(IJ)
ISN 0338           S1 = SIN(ARG)
ISN 0339           C1 = COS(ARG)
ISN 0340           ARG = THEIJ(IJ)
ISN 0341           S2 = SIN(ARG)
ISN 0342           C2 = COS(ARG)
ISN 0343           ARG = PSIIJ(IJ)
ISN 0344           S3 = SIN(ARG)
ISN 0345           C3 = COS(ARG)
ISN 0346           DO 3392 J1 = 1,6
ISN 0347           T = SINCOS(J1)
ISN 0348           IF(T) 3394,3392,3398
ISN 0349       3394 T = -T
ISN 0350       3398 IF(T-1.E-10) 3396,3392,3392
ISN 0351       3396 SINCOS(J1) = 0.0
ISN 0352       3392 CONTINUE
ISN 0353           S1S2 = S1*S2
ISN 0354           C1S2 = C1*S2
ISN 0355           AIJ(1) = C2*C3
ISN 0356           AIJ(2) = C2*S3
ISN 0357           AIJ(3) = -S2
ISN 0358           AIJ(4) = -C1*S3 + S1S2*C3
ISN 0359           AIJ(5) = C1*C3 + S1S2*S3
ISN 0360           AIJ(6) = S1*C2
ISN 0361           AIJ(7) = S1*S3 + C1S2*C3
ISN 0362           AIJ(8) =-S1*C3 + C1S2*S3
ISN 0363           AIJ(9) = C1*C2
              C
              C  CALCULATE CURRENT BEAM LENGTH XXLB.
              C
ISN 0364           XXLB = SQRT(XIJ*XIJ+YIJ*YIJ+ZIJ*ZIJ)
              C
```

```
                  C  CALCULATE AIJTAJ AND AIJTAI.  FILL TEMP WITH EITHER AJ OR AI.          00004650
                  C                                                                         00004660
ISN 0365                DO 6000 I3=1,2                                                      00004670
ISN 0366                DO 6010 I4=1,9                                                      00004680
ISN 0367                IF(I3.EQ.2) GO TO 6020                                              00004690
ISN 0369                TEMP(I4) = AJ(I4)                                                   00004700
ISN 0370                GO TO 6010                                                          00004710
ISN 0371           6020 TEMP(I4) = AI(I4)                                                   00004720
ISN 0372           6010 CONTINUE                                                            00004730
ISN 0373                L2 = 0                                                              00004740
ISN 0374                DO 6030 K2=1,3                                                      00004750
ISN 0375                DO 6040 J2=1,3                                                      00004760
ISN 0376                L2 = L2+1                                                           00004770
ISN 0377                SUMM(L2) = 0.                                                       00004780
ISN 0378                DO 6050 I2=1,3                                                      00004790
ISN 0379                SUMM(L2) = SUMM(L2) + AIJ(3*(J2-1)+I2)*TEMP(3*(K2-1)+I2)            00004800
ISN 0380           6050 CONTINUE                                                            00004810
ISN 0381                IF(I3.EQ.2) GO TO 6060                                              00004820
ISN 0383                AIJTAJ(L2) = SUMM(L2)                                               00004830
ISN 0384                GO TO 6040                                                          00004840
ISN 0385           6060 AIJTAI(L2) = SUMM(L2)                                               00004850
ISN 0386           6040 CONTINUE                                                            00004860
ISN 0387           6030 CONTINUE                                                            00004870
ISN 0388           6000 CONTINUE                                                            00004880
                  C                                                                         00004890
                  C  CALCULATE VELOCITIES AND INCREMENTAL DEFLECTIONS AT J,N                00004900
                  C  AND I,M IN BEAM AXES.                                                  00004910
                  C                                                                         00004920
ISN 0389                VJ(1) = AIJTAJ(1)*UMODJ+AIJTAJ(4)*VMODJ+AIJTAJ(7)*WMODJ             00004930
ISN 0390                VJ(2) = AIJTAJ(2)*UMODJ+AIJTAJ(5)*VMODJ+AIJTAJ(8)*WMODJ             00004940
ISN 0391                VJ(3) = AIJTAJ(3)*UMODJ+AIJTAJ(6)*VMODJ+AIJTAJ(9)*WMODJ             00004950
ISN 0392                VJ(4) = AIJTAJ(1)*PJ+AIJTAJ(4)*QJ+AIJTAJ(7)*RJ                      00004960
ISN 0393                VJ(5) = AIJTAJ(2)*PJ+AIJTAJ(5)*QJ+AIJTAJ(8)*RJ                      00004970
ISN 0394                VJ(6) = AIJTAJ(3)*PJ+AIJTAJ(6)*QJ+AIJTAJ(9)*RJ                      00004980
ISN 0395                VI(1) = AIJTAI(1)*UMODI+AIJTAI(4)*VMODI+AIJTAI(7)*WMODI             00004990
ISN 0396                VI(2) = AIJTAI(2)*UMODI+AIJTAI(5)*VMODI+AIJTAI(8)*WMODI             00005000
ISN 0397                VI(3) = AIJTAI(3)*UMODI+AIJTAI(6)*VMODI+AIJTAI(9)*WMODI             00005010
ISN 0398                VI(4) = AIJTAI(1)*PI+AIJTAI(4)*QI+AIJTAI(7)*RI                      00005020
ISN 0399                VI(5) = AIJTAI(2)*PI+AIJTAI(5)*QI+AIJTAI(8)*RI                      00005030
ISN 0400                VI(6) = AIJTAI(3)*PI+AIJTAI(6)*QI+AIJTAI(9)*RI                      00005040
ISN 0401                DJ(1) = AIJ(1)*DXMODJ + AIJ(2)*DYMODJ + AIJ(3)*DZMODJ               00005050
ISN 0402                DJ(2) = AIJ(4)*DXMODJ + AIJ(5)*DYMODJ + AIJ(6)*DZMODJ               00005060
ISN 0403                DJ(3) = AIJ(7)*DXMODJ + AIJ(8)*DYMODJ + AIJ(9)*DZMODJ               00005070
ISN 0404                DI(1) = AIJ(1)*DXMODI + AIJ(2)*DYMODI + AIJ(3)*DZMODI               00005080
ISN 0405                DI(2) = AIJ(4)*DXMODI + AIJ(5)*DYMODI + AIJ(6)*DZMODI               00005090
ISN 0406                DI(3) = AIJ(7)*DXMODI + AIJ(8)*DYMODI + AIJ(9)*DZMODI               00005100
ISN 0407                DJ(4) = AIJTAJ(1)*DPIN(J)+AIJTAJ(4)*DQIN(J)+AIJTAJ(7)*DRIN(J)       00005110
ISN 0408                DJ(5) = AIJTAJ(2)*DPIN(J)+AIJTAJ(5)*DQIN(J)+AIJTAJ(8)*DRIN(J)       00005120
ISN 0409                DJ(6) = AIJTAJ(3)*DPIN(J)+AIJTAJ(6)*DQIN(J)+AIJTAJ(9)*DRIN(J)       00005130
ISN 0410                DI(4) = AIJTAI(1)*DPIN(I)+AIJTAI(4)*DQIN(I)+AIJTAI(7)*DRIN(I)       00005140
ISN 0411                DI(5) = AIJTAI(2)*DPIN(I)+AIJTAI(5)*DQIN(I)+AIJTAI(8)*DRIN(I)       00005150
ISN 0412                DI(6) = AIJTAI(3)*DPIN(I)+AIJTAI(6)*DQIN(I)+AIJTAI(9)*DRIN(I)       00005160
                  C                                                                         00005170
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             C  CALCULATE VELOCITIES AND RELATIVE INCREMENTAL DEFLECTIONS (J-I) AND  00005180
             C  SUMS (J+I) FOR INTERNAL FORCE CALCULATIONS.  VEEN(1 AND 2) ARE       00005190
             C  USED FOR OUTPUT ONLY.                                                00005200
             C                                                                       00005210
ISN 0413           DO 6100 J2=1,9                                                    00005220
ISN 0414           IF(J2.GT.6) GO TO 6110                                            00005230
ISN 0416           D(J2) = DJ(J2) - DI(J2)                                           00005240
ISN 0417           VEL(J2) = VJ(J2) - VI(J2)                                         00005250
ISN 0418           GO TO 6100                                                        00005260
ISN 0419      6110 D(J2) = DJ(J2-3) + DI(J2-3)                                       00005270
ISN 0420           IF(J2.NE.7) VEEN(J2-7,IJ) = VEEN(J2-7,IJ)+D(J2)                   00005280
ISN 0422           VEL(J2) = VJ(J2-3) + VI(J2-3)                                     00005290
ISN 0423      6100 CONTINUE                                                          00005300
ISN 0424           DPHIIJ(IJ) = D(7)/2.                                              00005310
             C                                                                       00005320
             C     MARCH 1977 INTERNAL FORCE CODING                                  00005330
             C                                                                       00005340
ISN 0425           DO 150 K = 1,6                                                    00005350
ISN 0426           IJK = IJK+1                                                       00005360
             C                                                                       00005370
             C     NOW LETS GET A KR IF A TABLE EXISTS                               00005380
             C     FIRST DETERMINE WHICH TABLE WE WANT                               00005390
             C                                                                       00005400
ISN 0427           ITN = NLSFLG(IJK)                                                 00005410
ISN 0428           IF(ITN.EQ.0) GO TO 144                                            00005420
ISN 0430           IF(K.EQ.1.OR.K.EQ.4) GO TO 191                                    00005430
ISN 0432           IF(K.EQ.2.OR.K.EQ.6) GO TO 192                                    00005440
ISN 0434           IF(KFL35(IJ).EQ.0) GO TO 191                                      00005450
ISN 0436           KPR = KFL35(IJ)                                                   00005460
ISN 0437           GO TO 193                                                         00005470
ISN 0438       192 IF(KFL26(IJ).EQ.0) GO TO 191                                      00005480
ISN 0440           KPR = KFL26(IJ)                                                   00005490
ISN 0441           GO TO 193                                                         00005500
ISN 0442       191 KPR = K                                                           00005510
             C                                                                       00005520
             C     KPR IS THE TABLE NUMBER (1-6) FOR CURRENT IJK                     00005530
             C                                                                       00005540
ISN 0443       193 MYSUB = IJK-K+KPR                                                 00005550
ISN 0444           ITN = NLSFLG(MYSUB)                                               00005560
ISN 0445           IF(K.NE.1.OR.IJUB(IJ).EQ.0) GO TO 200                             00005570
ISN 0447           AXK=ABS(VEE(MYSUB))-DB(IJ)                                        00005580
ISN 0448           IF(AXK.LT.0.) AXK=0.                                              00005590
ISN 0450           IF((VEE(MYSUB).LT.0.AND.IJUB(IJ).GT.0).OR.                        00005600
                  1  (VEE(MYSUB).GT.0.AND.IJUB(IJ).LT.0)) AXK=0.                     00005610
ISN 0452           GO TO 201                                                         00005620
ISN 0453       200 AXK = ABS(VEE(MYSUB))                                             00005630
ISN 0454       201 PTR = CHUG(ITN)                                                   00005640
ISN 0455           IF(AXK.LT.XKR(PTR)) GO TO 110                                     00005650
ISN 0457           IF(AXK.GT.XKR(PTR+1)) GO TO 120                                   00005660
ISN 0459       140 KR(K) = XKS(PTR)*AXK+XKI(PTR)                                     00005670
             C                                                                       00005680
             C     CALCULATE STUFF FOR YIELDING AND RUPTURE SUMMARY TABLES,          00005690
             C     (YIELDING ONLY HERE).                                             00005700
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             C                                                                    00005710
ISN 0460           IF(KRFLAG(IJK).NE.0) GO TO 141                                 00005720
ISN 0462           IF(KR(K).EQ.1.) GO TO 141                                      00005730
ISN 0464           KRCONT = KRCONT+1                                              00005740
ISN 0465           TKR(KRCONT) = TIME                                             00005750
ISN 0466           KRBEAM(1,KRCONT) = IJ                                          00005760
ISN 0467           KRBEAM(2,KRCONT) = K                                           00005770
ISN 0468           KRFLAG(IJK) = 1                                                00005780
ISN 0469           GO TO 141                                                      00005790
             C*****CHUG DOWN                                                      00005800
ISN 0470       110 PTR = PTR-1                                                    00005810
ISN 0471           IF(AXK.LT.XKR(PTR)) GO TO 110                                  00005820
ISN 0473       130 CHUG(ITN) = PTR                                                00005830
ISN 0474           GO TO 140                                                      00005840
             C*****CHUG UP                                                        00005850
ISN 0475       120 PTR = PTR+1                                                    00005860
ISN 0476           IF(AXK.GT.XKR(PTR+1)) GO TO 120                                00005870
ISN 0478           GO TO 130                                                      00005880
ISN 0479       144 KR(K) = 1                                                      00005890
ISN 0480           GO TO 150                                                      00005900
             C                                                                    00005910
             C     AFTER ALL THIS CHUGGING,140 CALCULATES KR.                     00005920
             C     NOTE THAT 130 SAVED LOCATION IN TABLE NO. ITN FOR THE          00005930
             C     STARTING POINT AT THE NEXT TIME CUT.                           00005940
             C                                                                    00005950
ISN 0481       141 IF(K.EQ.1.OR.K.EQ.4) GO TO 150                                 00005960
ISN 0483           IF(K.EQ.2.OR.K.EQ.6) GO TO 142                                 00005970
ISN 0485           IF(KR(K).NE.1.AND.KFL35(IJ).EQ.0) KFL35(IJ) = K                00005980
ISN 0487           GO TO 150                                                      00005990
ISN 0488       142 IF(KR(K).NE.1.AND.KFL26(IJ).EQ.0) KFL26(IJ) = K                00006000
             C                                                                    00006010
             C     THIS LOOP SETS KFL35 TO EITHER 3 OR 5,WHICHEVER KR TABLE       00006020
             C     GOES NONLINEAR FIRST. FROM THEN ON,KR WILL BE READ FROM        00006030
             C     THAT TABLE WHETHER K=3 OR 5. THE SAME GOES FOR KFL26.          00006040
             C                                                                    00006050
ISN 0490       150 CONTINUE                                                       00006060
             C                                                                    00006070
             C  SET KR=1. FOR UNLOADING AND RELOADING.                            00006080
             C                                                                    00006090
ISN 0491           IJL = 6*(IJ-1)                                                 00006100
ISN 0492           DO 7000 L = 1,6                                                00006110
ISN 0493           IJL = IJL + 1                                                  00006120
ISN 0494           A = D(L)                                                       00006130
             C                                                                    00006140
             C     CORRECT Y AND Z DEFLECTIONS BY REMOVING ROTATION COMPONENT.    00006150
             C     SEE ALSO LABEL 632.                                            00006160
             C                                                                    00006170
ISN 0495           IF(L.EQ.2) A=A-XXLB*D(9)/2.                                    00006180
ISN 0497           IF(L.EQ.3) A=A+XXLB*D(8)/2.                                    00006190
ISN 0499           B = A + VEE(IJL)                                               00006200
ISN 0500           IF(A.GE.0.0.AND.B.GE.0.0.OR.A.LT.0.0.AND.B.LT.0.0) GO TO 7010  00006210
             C                                                                    00006220
             C     SIGNS ARE NOT THE SAME (UNLOADING)                             00006230
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                C                                                                       00006240
ISN 0502              IF(N1(IJL).NE.0) GO TO 7020                                       00006250
ISN 0504              N1(IJL) = 1                                                       00006260
ISN 0505              VEEBAR(IJL) = ABS(VEE(IJL))                                       00006270
ISN 0506              GO TO 7020                                                        00006280
ISN 0507         7010 IF(ABS(VEE(IJL)).LT.VEEBAR(IJL)) GO TO 7020                       00006290
                C                                                                       00006300
                C  LOADING PATH, USE KR FROM ABOVE.                                     00006310
                C                                                                       00006320
ISN 0509              N1(IJL) = 0                                                       00006330
ISN 0510              GO TO 7000                                                        00006340
ISN 0511         7020 KR(L) = 1.                                                        00006350
ISN 0512         7000 CONTINUE                                                          00006360
ISN 0513              IF(KR(5).NE.KR(3)) KR(5) = KR(3)                                  00006370
ISN 0515              IF(KR(6).NE.KR(2)) KR(6) = KR(2)                                  00006380
                C                                                                       00006390
                C LETS GET THE STIFFNESSES.                                             00006400
                C                                                                       00006410
ISN 0517              ISTART = 36*(IJ-1)                                                00006420
ISN 0518              XK11 = XK(ISTART +  1)                                            00006430
ISN 0519              XK22 = XK(ISTART +  8)                                            00006440
ISN 0520              XK26 = XK(ISTART + 12)                                            00006450
ISN 0521              XK33 = XK(ISTART + 15)                                            00006460
ISN 0522              XK35 = XK(ISTART + 17)                                            00006470
ISN 0523              XK44 = XK(ISTART + 22)                                            00006480
ISN 0524              XK55 = XK(ISTART + 29)                                            00006490
ISN 0525              XK66 = XK(ISTART + 36)                                            00006500
                C                                                                       00006510
                C  CORRECT STIFFNESSES FOR CURRENT BEAM LENGTH.                         00006520
                C  XXLB IS CURRENT LENGTH, XLB(IJ) IS ORIGINAL LENGTH.                  00006530
                C                                                                       00006540
ISN 0526              XLRAT1 = XLB(IJ)/XXLB                                             00006550
ISN 0527              XLRAT2 = XLRAT1*XLRAT1                                            00006560
ISN 0528              XLRAT3 = XLRAT1*XLRAT2                                            00006570
ISN 0529              XK11SR=XK11                                                       00006580
ISN 0530              XK44SR=XK44                                                       00006590
ISN 0531              XK55SR=XK55                                                       00006600
ISN 0532              XK66SR=XK66                                                       00006610
ISN 0533              XK22SR=XK22                                                       00006620
ISN 0534              XK33SR=XK33                                                       00006630
ISN 0535              XK26SR=XK26                                                       00006640
ISN 0536              XK35SR=XK35                                                       00006650
ISN 0537              IF(NOLEO.EQ.0) GO TO 4080                                         00006660
ISN 0539              DO 4081 JJ=1,NOLEO                                                00006670
ISN 0540              IF(IGOLEO(JJ).EQ.IG(IJ).AND. JGOLEO(JJ).EQ.JG(IJ).AND.MGOLEO(JJ)  00006680
                     1 .EQ.MG(IJ).AND.NGOLEO(JJ).EQ.NG(IJ)) GO TO 4083                  00006690
ISN 0542         4081 CONTINUE                                                          00006700
ISN 0543              GO TO 4080                                                        00006710
ISN 0544         4083 XK55SR=XK55*SQRT(XLRAT1)                                          00006720
ISN 0545              XK66SR=XK66*SQRT(XLRAT1)                                          00006730
ISN 0546              XK22SR=XK22*SQRT(XLRAT3)                                          00006740
ISN 0547              XK33SR=XK33*SQRT(XLRAT3)                                          00006750
ISN 0548              XK26SR=XK26*SQRT(XLRAT2)                                          00006760
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ISN 0549          XK35SR=XK35*SQRT(XLRAT2)                                         00006770
ISN 0550          XK55=XK55*XLRAT1                                                 00006780
ISN 0551          XK66=XK66*XLRAT1                                                 00006790
ISN 0552          XK22=XK22*XLRAT3                                                 00006800
ISN 0553          XK33=XK33*XLRAT3                                                 00006810
ISN 0554          XK26=XK26*XLRAT2                                                 00006820
ISN 0555          XK35=XK35*XLRAT2                                                 00006830
ISN 0556     4080 CONTINUE                                                         00006840
            C                                                                      00006850
            C  CALCULATE INCREMENTAL STRAIN FORCES DFJ AND DAMPING FORCES FDJ      00006860
            C  AT J,N IN BEAM AXES.                                                00006870
            C                                                                      00006880
ISN 0557          DFJ(1) = XK11*D(1)                                               00006890
ISN 0558          FDJ(1) = XK11SR*VEL(1)                                           00006900
ISN 0559          IF(IJUB(IJ).EQ.0) GO TO 202                                      00006910
ISN 0561          FDJ(1) = 0.                                                      00006920
ISN 0562          IJ1 = 6*(IJ-1)+1                                                 00006930
ISN 0563          IF(ABS(VEE(IJ1)+D(1)).GE.DB(IJ)) GO TO 202                       00006940
ISN 0565          DFJ(1) = 0.                                                      00006950
ISN 0566      202 DFJ(4) = XK44*D(4)                                               00006960
ISN 0567          FDJ(4) = XK44SR*VEL(4)                                           00006970
            C                                                                      00006980
            C  CALCULATE 2,6 LOADS.                                                00006990
            C                                                                      00007000
ISN 0568          IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 204                       00007010
ISN 0570          IJPIN=0                                                          00007020
ISN 0571          IF(PZ(IJ).NE.0.AND.ABS(SUMDFI(6,IJ)).GE.PLM26(IJ)) GO TO 810     00007030
ISN 0573          IF(PZJ(IJ).NE.0.AND.ABS(SUMDF(6,IJ)).GE.PLM26J(IJ)) GO TO 812    00007040
ISN 0575          GO TO 204                                                        00007050
ISN 0576      810 IF(PLM26(IJ).EQ.0.OR.FL26I(IJ).NE.0) GO TO 814                   00007060
            C                                                                      00007070
            C      FIRST TIME THRU FOR PLASTIC HINGE FORMATION SAVE DATA           00007080
            C       FOR SUMMARY TABLE. I END OF BEAM,6 DIRECTION                   00007090
            C                                                                      00007100
ISN 0578          FL26I(IJ)=1                                                      00007110
ISN 0579          KPL=KPL+1                                                        00007120
ISN 0580          TPL(KPL)=TIME                                                    00007130
ISN 0581          BPL(KPL,1)=IJ                                                    00007140
ISN 0582          BPL(KPL,2)=6                                                     00007150
ISN 0583          IF(SUMDFI(6,IJ).LT.0.) BPL(KPL,2)=-6                             00007160
ISN 0585          BPL(KPL,3)=IG(IJ)                                                00007170
ISN 0586      814 IF(PZJ(IJ).NE.0.AND.ABS(SUMDF(6,IJ)).GE.PLM26J(IJ)) GO TO 816    00007180
ISN 0588          GO TO 208                                                        00007190
ISN 0589      816 IJPIN=1                                                          00007200
ISN 0590      812 IF(PLM26J(IJ).EQ.0.OR.FL26J(IJ).NE.0) GO TO 818                  00007210
            C                                                                      00007220
            C      FIRST TIME THRU FOR PLASTIC HINGE FORMATION.                    00007230
            C       SAVE DATA FOR SUMMARY TABLE. J END OF BEAM,6 DIRECTION         00007240
            C                                                                      00007250
ISN 0592          FL26J(IJ)=1                                                      00007260
ISN 0593          KPL=KPL+1                                                        00007270
ISN 0594          TPL(KPL)=TIME                                                    00007280
ISN 0595          BPL(KPL,1)=IJ                                                    00007290
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ISN 0596          BPL(KPL,2)=6                                                  00007300
ISN 0597          IF(SUMDF(6,IJ).LT.0.) BPL(KPL,2)=-6                           00007310
ISN 0599          BPL(KPL,3)=JG(IJ)                                             00007320
ISN 0600      818 IF(IJPIN.EQ.1) GC TO 206                                      00007330
            C                                                                   00007340
            C  PINNED AT J ONLY.                                                00007350
            C                                                                   00007360
ISN 0602          DFJ(2) = XK22/4*D(2)+XK26/2*DI(6)                             00007370
ISN 0603          FDJ(2) = XK22SR/4*VEL(2)+XK26SR/2*VI(6)                       00007380
ISN 0604          DFJ(6) = 0.                                                   00007390
ISN 0605          FDJ(6) = 0.                                                   00007400
ISN 0606          GO TO 210                                                     00007410
            C                                                                   00007420
            C  PINNED AT I ONLY.                                                00007430
            C                                                                   00007440
ISN 0607      208 DFJ(2) = XK22/4*D(2) + XK26/2*DJ(6)                           00007450
ISN 0608          FDJ(2) = XK22SR/4*VEL(2) + XK26SR/2*VJ(6)                     00007460
ISN 0609          DFJ(6) = XK26/2*D(2) + XK66*3/4*DJ(6)                         00007470
ISN 0610          FDJ(6) = XK26SR/2*VEL(2) + XK66SR*3/4*VJ(6)                   00007480
ISN 0611          GO TO 210                                                     00007490
            C                                                                   00007500
            C  PINNED AT I AND J.                                               00007510
            C                                                                   00007520
ISN 0612      206 DFJ(2) = 0.                                                   00007530
ISN 0613          FDJ(2) = 0.                                                   00007540
ISN 0614          DFJ(6) = 0.                                                   00007550
ISN 0615          FDJ(6) = 0.                                                   00007560
ISN 0616          GO TO 210                                                     00007570
            C                                                                   00007580
            C  FIXED AT I AND J.  (NORMAL CASE)                                 00007590
            C                                                                   00007600
ISN 0617      204 DFJ(2) = XK22*D(2) + XK26*D(9)                                00007610
ISN 0618          FDJ(2) = XK22SR*VEL(2) + XK26SR*VEL(9)                        00007620
ISN 0619          DFJ(6) = XK66*(D(6)+3.*D(9))/4. + XK26*D(2)                   00007630
ISN 0620          FDJ(6) = XK66SR*(VEL(6)+3.*VEL(9))/4. + XK26SR*VEL(2)         00007640
            C                                                                   00007650
            C  CALCULATE 3,5 LOADS.                                             00007660
            C                                                                   00007670
ISN 0621      210 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 214                    00007680
ISN 0623          IJPIN=0                                                       00007690
ISN 0624          IF(PY(IJ).NE.0.AND.ABS(SUMDFI(5,IJ)).GE.PLM35(IJ)) GO TO 820  00007700
ISN 0626          IF(PYJ(IJ).NE.0.AND.ABS(SUMDF(5,IJ)).GE.PLM35J(IJ)) GO TO 822 00007710
ISN 0628          GO TO 214                                                     00007720
ISN 0629      820 IF(PLM35(IJ).EQ.0.OR.FL35I(IJ).NE.0) GO TO 824                00007730
            C                                                                   00007740
            C      FIRST TIME THRU FOR PLASTIC HINGE FORMATION.SAVE DATA        00007750
            C      FOR SUMMARY TABLE. I END OF BEAM,5 DIRECTION                 00007760
            C                                                                   00007770
ISN 0631          FL35I(IJ)=1                                                   00007780
ISN 0632          KPL=KPL+1                                                     00007790
ISN 0633          TPL(KPL)=TIME                                                 00007800
ISN 0634          BPL(KPL,1)=IJ                                                 00007810
ISN 0635          BPL(KPL,2)=5                                                  00007820
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ISN 0636          IF(SUMDFI(5,IJ).LT.0.) BPL(KPL,2)=-5
ISN 0638          BPL(KPL,3)=IG(IJ)
ISN 0639      824 IF(PYJ(IJ).NE.0.AND.ABS(SUMDF(5,IJ)).GE.PLM35J(IJ)) GO TO 826
ISN 0641          GO TO 218
ISN 0642      826 IJPIN=1
ISN 0643      822 IF(PLM35J(IJ).EQ.0.OR.FL35J(IJ).NE.0) GO TO 828
            C
            C     FIRST TIME THRU FOR PLASTIC HINGE FORMATION.
            C     SAVE DATA FOR SUMMARY TABLE. J END OF BEAM,5 DIRECTION
            C
ISN 0645          FL35J(IJ)=1
ISN 0646          KPL=KPL+1
ISN 0647          TPL(KPL)=TIME
ISN 0648          BPL(KPL,1)=IJ
ISN 0649          BPL(KPL,2)=5
ISN 0650          IF(SUMDF(5,IJ).LT.0) BPL(KPL,2)=-5
ISN 0652          BPL(KPL,3)=JG(IJ)
ISN 0653      828 IF(IJPIN.EQ.1) GO TO 216
            C
            C  PINNED AT J ONLY.
            C
ISN 0655          DFJ(3) = XK33/4*D(3)+XK35/2*DI(5)
ISN 0656          FDJ(3) = XK33SR/4*VEL(3)+XK35SR/2*VI(5)
ISN 0657          DFJ(5) = 0.
ISN 0658          FDJ(5) = 0.
ISN 0659          GO TO 220
            C
            C  PINNED AT I ONLY.
            C
ISN 0660      218 DFJ(3) = XK33/4*D(3) + XK35/2*DJ(5)
ISN 0661          FDJ(3) = XK33SR/4*VEL(3) + XK35SR/2*VJ(5)
ISN 0662          DFJ(5) = XK35/2*D(3) + XK55*3/4*DJ(5)
ISN 0663          FDJ(5) = XK35SR/2*VEL(3) + XK55SR*3/4*VJ(5)
ISN 0664          GO TO 220
            C
            C  PINNED AT I AND J.
            C
ISN 0665      216 DFJ(3) = 0.
ISN 0666          FDJ(3) = 0.
ISN 0667          DFJ(5) = 0.
ISN 0668          FDJ(5) = 0.
ISN 0669          GO TO 220
            C
            C  FIXED AT I AND J.  (NORMAL CASE)
            C
ISN 0670      214 DFJ(3) = XK33*D(3) + XK35*D(8)
ISN 0671          FDJ(3) = XK33SR*VEL(3) + XK35SR*VEL(8)
ISN 0672          DFJ(5) = XK55*(D(5)+3.*D(8))/4. + XK35*D(3)
ISN 0673          FDJ(5) = XK55SR*(VEL(5)+3.*VEL(8))/4. + XK35SR*VEL(3)
            C
            C  MULTIPLY DFJ'S BY KR'S.
            C
ISN 0674      220 DO 7030 J2=1,6
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ISN 0675          DFJ(J2) = KR(J2)*DFJ(J2)                                  00008360
ISN 0676     7030 CONTINUE                                                  00008370
            C                                                               00008380
            C  MULTIPLY FDJ'S BY DAMPING CONSTANTS.                         00008390
            C                                                               00008400
ISN 0677      222 DO 6130 J2=1,6                                            00008410
ISN 0678          IF(J2.EQ.1.OR.J2.EQ.4) GO TO 6132                         00008420
ISN 0680          IF(J2.EQ.2.OR.J2.EQ.6) GO TO 6134                         00008430
ISN 0682          CON = 0.5*(C(3,IJ)+C(5,IJ))                               00008440
ISN 0683          GO TO 6136                                                00008450
ISN 0684     6134 CON = 0.5*(C(2,IJ)+C(6,IJ))                               00008460
ISN 0685     6136 FDJ(J2) = CON*FDJ(J2)                                     00008470
ISN 0686          FDJ(J2)=KR(J2)*FDJ(J2)                                    00008480
ISN 0687          GO TO 6130                                                00008490
ISN 0688     6132 FDJ(J2) = C(J2,IJ)*FDJ(J2)                                00008500
ISN 0689          FDJ(J2)=KR(J2)*FDJ(J2)                                    00008510
ISN 0690     6130 CONTINUE                                                  00008520
            C                                                               00008530
            C  CALCULATE INCREMENTAL FORCES AT I,M USING                     00008540
            C  STATIC BALANCE EQUATIONS.  DAMPING FORCES ARE TOTAL.         00008550
            C                                                               00008560
ISN 0691          DO 6120 J2=1,6                                            00008570
ISN 0692          DFI(J2) = -DFJ(J2)                                        00008580
ISN 0693          FDI(J2) = -FDJ(J2)                                        00008590
ISN 0694     6120 CONTINUE                                                  00008600
ISN 0695          DFI(5) = DFI(5) + XXLB*DFJ(3)                             00008610
ISN 0696          DFI(6) = DFI(6) - XXLB*DFJ(2)                             00008620
ISN 0697          FDI(5) = FDI(5) + XXLB*FDJ(3)                             00008630
ISN 0698          FDI(6) = FDI(6) - XXLB*FDJ(2)                             00008640
            C                                                               00008650
            C  NOW SUM OVER TIME TO GET CURRENT TOTAL                        00008660
            C  FORCES AT I,M AND J,N.  STILL IN BEAM AXES.                   00008670
            C                                                               00008680
ISN 0699          IJK1 = 6*(IJ-1) + 1                                       00008690
ISN 0700          DO 630 K=1,6                                              00008700
            C                                                               00008710
            C  CHECK FOR UNSYMMETRICAL BEAMS.                               00008720
            C                                                               00008730
ISN 0701          IF(K.NE.1.OR.IJUB(IJ).EQ.0) GO TO 602                     00008740
ISN 0703          IF(TIME.EQ.0.) FUB(IJ) = 0.                               00008750
ISN 0705          FUB(IJ) = FUB(IJ) + DFJ(K)                                00008760
            C                                                               00008770
            C  FUB(IJ) IS THE TOTAL AXIAL LOAD FOR UNSYMMETRICAL BEAMS       00008780
            C  WITHOUT ANY RESTRICTIONS ON + OR -.  NOW ZERO OUT SUMDF       00008790
            C  IF REQUIRED. SUMDF IS USED IN SUBSEQUENT CALC'S AND PRINT.   00008800
            C                                                               00008810
ISN 0706          A = D(K)                                                  00008820
ISN 0707          B = VEE(IJK1) + A                                         00008830
ISN 0708          IF((B.LT.0.AND.IJUB(IJ).GT.0).OR.                         00008840
                1   (B.GT.0.AND.IJUB(IJ).LT.0)) GO TO 606                   00008850
ISN 0710          IF((FUB(IJ).LE.0.AND.IJUB(IJ).LT.0).OR.                   00008860
                1   (FUB(IJ).GE.0.AND.IJUB(IJ).GT.0)) GO TO 604             00008870
ISN 0712      606 SUMDF(K,IJ) = 0.                                          00008880
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ISN 0713           SUMDFI(K,IJ) = 0.                                                00008890
ISN 0714           GO TO 600                                                        00008900
ISN 0715       604 SUMDF(K,IJ) = FUB(IJ)                                            00008910
ISN 0716           SUMDFI(K,IJ) = -FUB(IJ)                                          00008920
ISN 0717           GO TO 600                                                        00008930
ISN 0718       602 SUMDF(K,IJ) = SUMDF(K,IJ) + DFJ(K)                               00008940
ISN 0719           SUMDFI(K,IJ) = SUMDFI(K,IJ) + DFI(K)                             00008950
ISN 0720       600 FSJ(K) = SUMDF(K,IJ)                                             00008960
ISN 0721           FSI(K) = SUMDFI(K,IJ)                                            00008970
ISN 0722           FINT(K,IJ) = FSJ(K) + FDJ(K)                                     00008980
ISN 0723           FINTI(K,IJ) = FSI(K) + FDI(K)                                    00008990
             C                                                                      00009000
             C      REDO AXIAL LOAD CALCULATIONS FOR LANDING GEAR OLEO MODULES      00009010
             C      STRAIN FORCES ARE DUE TO AIR CURVE,DAMPING FORCES ARE DUE       00009020
             C      TO HYDRAULIC DAMPING & FRICTION                                 00009030
             C                                                                      00009040
ISN 0724           IF(NOLEO.EQ.0 .OR.K.NE.1) GO TO 630                              00009050
ISN 0726           DO 700 JJ=1,NOLEO                                                00009060
ISN 0727             IF(I.EQ.IGOLEO(JJ).AND.J.EQ.JGOLEO(JJ).AND.M.EQ.MGOLEO(JJ)     00009070
                  1 .AND.N.EQ.NGOLEO(JJ)) GO TO 702                                 00009080
ISN 0729       700 CONTINUE                                                         00009090
ISN 0730           GO TO 630                                                        00009100
ISN 0731       702 YOLEO(JJ)=YOLEO(JJ)-D(1)                                         00009110
ISN 0732           YDOLEO=-VEL(1)                                                   00009120
ISN 0733           FA=FAO(JJ)*(EOLEO(JJ)/(EOLEO(JJ)-YOLEO(JJ)))**EXPOLE(JJ)-FAA(JJ) 00009130
ISN 0734           BDAMP=BOLEO(JJ)                                                  00009140
ISN 0735           IF(YDOLEO.LT.0) BDAMP=BROLEO(JJ)                                 00009150
ISN 0737           FH=BDAMP*YDOLEO*ABS(YDOLEO)                                      00009160
ISN 0738           ARGU=YDOLEO/ALPHAP                                               00009170
ISN 0739           FC=FCOUL(JJ)*TANH(ARGU)                                          00009180
ISN 0740           FCOMP=(YOLEO(JJ)-YMAX(JJ))*XKCOMP(JJ)                            00009190
ISN 0741           IF(FCOMP.LT.0.) FCOMP=0.                                         00009200
ISN 0743           FEXT=YOLEO(JJ)*XKEXT(JJ)                                         00009210
ISN 0744           IF(FEXT.GT.0. ) FEXT=0.                                          00009220
ISN 0746           FOLEO=FA+FH+FC+FEXT+FCOMP                                        00009230
ISN 0747           SUMDFI(K,IJ)=FA+FCOMP+FEXT                                       00009240
ISN 0748           SUMDF(K,IJ)=-SUMDFI(K,IJ)                                        00009250
ISN 0749           FSJ(K)=SUMDF(K,IJ)                                               00009260
ISN 0750           FSI(K)=SUMDFI(K,IJ)                                              00009270
ISN 0751           FDI(K)=FH+FC                                                     00009280
ISN 0752           FDJ(K)=-FDI(K)                                                   00009290
ISN 0753           FINT(K,IJ)=FSJ(K)+FDJ(K)                                         00009300
ISN 0754           FINTI(K,IJ)=FSI(K)+FDI(K)                                        00009310
ISN 0755       630 CONTINUE                                                         00009320
             C                                                                      00009330
             C     STRESS CALCULATIONS                                              00009340
             C                                                                      00009350
ISN 0756           IF(NSC.EQ.0) GO TO 633                                           00009360
             C                                                                      00009370
             C     Z1,Z2,XIQ AND SYIELD DATA STORED IN SMALL ARRAYS,REFERENCED BY   00009380
             C     NJ,WHICH VARIES FROM 1 TO NS. OTHER DATA STORED IN LARGE ARRAYS  00009390
             C     FOR BEAM DATA,REFERENCED BY IJ,WHICH VARIES FROM 1 TO NB.        00009400
             C                                                                      00009410
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                 C
                 C     DETERMINE MAXIMUM BENDING MOMENTS ABOUT Y AND Z AXES.
                 C     THESE COULD OCCUR AT EITHER END OF BEAM (I OR J).
                 C     SHEAR FORCES AND AXIAL LOAD AND TORSION ARE CONSTANT ALONG BEAM.
                 C
ISN 0758          501 FX = FINT(1,IJ)
ISN 0759              FY = FINT(2,IJ)
ISN 0760              FZ = FINT(3,IJ)
ISN 0761              MX = FINT(4,IJ)
ISN 0762              MYJ = FINT(5,IJ)
ISN 0763              MZJ = FINT(6,IJ)
ISN 0764              MYI = MYJ-XXLB*FZ
ISN 0765              MZI = MZJ+XXLB*FY
ISN 0766              MY = MYJ
ISN 0767              MZ = MZJ
ISN 0768              IF(PCR(IJ).NE.0.) GO TO 510
ISN 0770              SBUCKR(IJ) = 0.
ISN 0771              GO TO 512
ISN 0772          510 SBUCKR(IJ)=FINT(1,IJ)/PCR(IJ)
ISN 0773          512 IF(ABS(MYI).GT.ABS(MYJ)) MY = MYI
ISN 0775              IF(ABS(MZI).GT.ABS(MZJ)) MZ = MZI
                 C
                 C     CALCULATE AXIAL STRESSES (SX) AND SHEAR STRESSES (SS)
                 C     FOR PLANE ELEMENTS LOCATED AT TOP,BOTTOM,RIGHT AND LEFT
                 C     SIDES OF BEAM.
                 C
                 C     IF YY(IJ),ZZ(IJ)=0 SXMY,SXMZ BLOW UP CODE TO BYPASS
ISN 0777              IF (YY(IJ).NE.0.) GO TO 502
ISN 0779              SXMY =0.0
ISN 0780              GO TO 507
ISN 0781          502 SXMY = MY*Z1(IJ)/YY(IJ)
ISN 0782          507 IF(ZZ(IJ).NE.0.) GO TO 503
ISN 0784              SXMZ =0.0
ISN 0785              GO TO 504
ISN 0786          503 SXMZ = MZ*Z2(IJ)/ZZ(IJ)
ISN 0787          504 SSMX = MX*XIQ(IJ)
ISN 0788              IF (AA(IJ).NE.0.0) GO TO 505
ISN 0790              SSFY =0.0
ISN 0791              SSFZ =0.0
ISN 0792              SXFX =0.0
ISN 0793              GO TO 506
ISN 0794          505 SSFY = FY/AA(IJ)*1.5
ISN 0795              SSFZ = FZ/AA(IJ)*1.5
ISN 0796              SXFX = FX/AA(IJ)
                 C
                 C     TOP (1)
                 C
ISN 0797          506 SAX(1) = SXFX-SXMY
ISN 0798              SS(1) = SSMX+SSFY
                 C
                 C     BOTTOM (2)
                 C
ISN 0799              SAX(2) = SXFX+SXMY
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ISN 0800          SS(2) =-SSMX+SSFY
            C
            C     LEFT (3)
            C
ISN 0801          SAX(3) = SXFX+SXMZ
ISN 0802          SS(3) = SSMX-SSFZ
            C
            C     RIGHT (4)
            C
ISN 0803          SAX(4) = SXFX-SXMZ
ISN 0804          SS(4) =-SSMX-SSFZ
            C
            C     NOW,FOR EACH OF THE FOUR LOCATIONS,CALCULATE MAXIMUM SHEAR
            C     STRESS (SSM) AND PRINCIPAL STRESSES (S1,S2). USE THESE TO
            C     FORM RATIOS OF ACTUAL STRESS/FAILURE STRESS FOR TWO FAILURE
            C     CRITERIA.THE TWO CRITERIA USED ARE MAXIMUM SHEAR THEORY AND
            C     THEORY OF CONSTANT ENERGY OF DISTORTION. REFER TO ROARK,P.94,29.
            C
ISN 0805          DO 653 IS=1,4
ISN 0806          SYIELD = STENS(MC(IJ))
ISN 0807          IF(SAX(IS).LT.0.) SYIELD=SCOMP(MC(IJ))
ISN 0809          SSM = SQRT(.25*SAX(IS)*SAX(IS)+SS(IS)*SS(IS))
ISN 0810          S1 = .5*SAX(IS)+SSM
ISN 0811          S2 = .5*SAX(IS)-SSM
ISN 0812          SP = SQRT(S1*S1+S2*S2-S1*S2)
ISN 0813          FRS(IJ,IS) = SSM/SHEAR(MC(IJ))
ISN 0814          FRD(IJ,IS) = SP/SYIELD
ISN 0815      653 CONTINUE
            C*****COMPUTE THE ENERGY HERE BUT ADD IT AFTER 230 (NO RUPTURE)
ISN 0816      633 SUMSEI = 0.0
ISN 0817          SUMDEI = 0.0
ISN 0818          SUMSEJ = 0.0
ISN 0819          SUMDEJ = 0.0
ISN 0820          SUMSE  = 0.0
ISN 0821          SUMDE  = 0.0
            C*****DON'T USE AN IJ IF IT'S A DRI ELEMENT
ISN 0822          IF(IJPR(IJ).NE.0) GO TO 632
ISN 0824          DO 631 K = 1,6
ISN 0825          SUMSEI = SUMSEI + FSI(K)*DI(K)
ISN 0826          SUMDEI = SUMDEI + FDI(K)*DI(K)
ISN 0827          SUMSEJ = SUMSEJ + FSJ(K)*DJ(K)
ISN 0828          SUMDEJ = SUMDEJ + FDJ(K)*DJ(K)
ISN 0829          SUMSE = SUMSEI + SUMSEJ
ISN 0830          SUMDE = SUMDEI + SUMDEJ
ISN 0831      631 CONTINUE
            C
            C  UPDATE DEFLECTIONS AND CHECK FOR RUPTURE.  FIRST CORRECT Y AND Z
            C  DEFLECTIONS BY REMOVING COMPONENTS DUE TO ROTATION OF MASSES.
            C
ISN 0832      632 D(2) = D(2) - XXLB*D(9)/2.
ISN 0833          D(3) = D(3) + XXLB*D(8)/2.
ISN 0834          IJL = 6*(IJ-1)
ISN 0835          DO 230 L = 1,6
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ISN 0836          IJL = IJL+1
ISN 0837          T = VEE(IJL)+D(L)
ISN 0838          TF=FINT(L,IJ)
ISN 0839          FEE(IJL)=TF
ISN 0840          VEE(IJL) = T
ISN 0841          IF(T) 240,250,250
ISN 0842      240 IF(ABS(T)-VMAXN(IJL)) 251,260,260
ISN 0843      250 IF(T-VMAX(IJL)) 251,260,260
ISN 0844      260 IRUPSW(IJ)=1
ISN 0845          IF(T) 252,253,253
ISN 0846      252 PRINT 1040,IJ,L,VEE(IJL),VMAXN(IJL),TIME
ISN 0847          NDIR=-1
ISN 0848     1040 FORMAT(1H1,'NEG.DIRECTION RUPTURE'//1X,'BEAM',2X,'DIRECTION',3X,
                 1 'MAGNITUDE',6X,'ALLOWABLE',6X,'TIME'//1X,I5,5X,I5,1P3E15.6)
ISN 0849          GO TO 256
ISN 0850      253 PRINT 1050,IJ,L,VEE(IJL),VMAX(IJL),TIME
ISN 0851          NDIR=1
ISN 0852     1050 FORMAT(1H1,'POS.DIRECTION RUPTURE'//1X,'BEAM',2X,'DIRECTION',3X,
                 1 'MAGNITUDE',6X,'ALLOWABLE',6X,'TIME'//1X,I5,5X,I5,1P3E15.6)
ISN 0853          GO TO 256
ISN 0854      251 IF(TF) 274,271,271
ISN 0855      274 IF(ABS(TF)-FMAXN(IJL)) 230,255,255
ISN 0856      271 IF(TF-FMAX(IJL)) 230,255,255
ISN 0857      255 IRUPSW(IJ)=1
ISN 0858          IF(TF) 272,273,273
ISN 0859      272 PRINT 1040,IJ,L,FEE(IJL),FMAXN(IJL),TIME
ISN 0860          NDIR=-1
ISN 0861          GO TO 256
ISN 0862      273 PRINT 1050,IJ,L,FEE(IJL),FMAX(IJL),TIME
ISN 0863          NDIR=1
             C
             C    CALCULATE STUFF FOR YIELDING AND RUPTURE SUMMARY TABLE,
             C    (RUPTURE ONLY HERE).
             C
ISN 0864      256 KRCONT = KRCONT+1
ISN 0865          TKR(KRCONT) = TIME
ISN 0866          KRBEAM(1,KRCONT) = IJ
ISN 0867          KRBEAM(3,KRCONT) = L
ISN 0868          KRBEAM(4,KRCONT)=NDIR
ISN 0869          GO TO 1000
ISN 0870      230 CONTINUE
ISN 0871          SEIJ(IJ) = SEIJ(IJ)+SUMSE
ISN 0872          DEIJ(IJ) = DEIJ(IJ)+SUMDE
             C
             C    SUM OVER BOTH TIME AND BEAMS.
             C
ISN 0873          XSE(I) = XSE(I) + SUMSEI
ISN 0874          XDE(I) = XDE(I) + SUMDEI
ISN 0875          IF(J.NE.81) GO TO 280
             C
             C    FOR TRANSVERSE BEAMS, ADD ENERGY AT J=81 END OF BEAM TO I MASS.
             C
ISN 0877          XSE(I) = XSE(I) + SUMSEJ
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ISN 0878          XDE(I) = XDE(I) + SUMDEJ
ISN 0879          GO TO 282
ISN 0880      280 XSE(J) = XSE(J) + SUMSEJ
ISN 0881          XDE(J) = XDE(J) + SUMDEJ
             C
             C    FOR A SYMMETRICAL MODEL WE MUST ADD SE AND DE CONTRIBUTIONS
             C    FROM THE OPPOSITE BEAMS THAT ARE NOT INPUT EXPLICITLY. WE
             C    DO NOT DO THIS FOR TRANSVERSE BEAMS OR THOSE ON THE
             C    AIRPLANE CL.
             C
ISN 0882      282 IF(SYMFLG.NE.1.OR.J.EQ.81.OR.CLTEST(IJ).EQ.1.) GO TO 238
ISN 0884          SEIJ(IJ) = SEIJ(IJ)+SUMSE
ISN 0885          DEIJ(IJ) = DEIJ(IJ)+SUMDE
ISN 0886          XSE(I) = XSE(I) + SUMSEI
ISN 0887          XSE(J) = XSE(J) + SUMSEJ
ISN 0888          XDE(I) = XDE(I) + SUMDEI
ISN 0889          XDE(J) = XDE(J) + SUMDEJ
ISN 0890      238 IF (IJPR(IJ).NE.0)      DRI(IJ) = -6.55D0*VEE(6*(IJ-1)+1)
             C
             C NOW ADD FSI AND FDI AND CALL IT FSI.  SAME AT J.  WE NO
             C LONGER NEED SEPARATE STRAIN AND DAMPING FORCES.
             C
ISN 0892          DO 270 J2=1,6
ISN 0893          FSI(J2) = FSI(J2) + FDI(J2)
ISN 0894          FSJ(J2) = FSJ(J2) + FDJ(J2)
ISN 0895      270 CONTINUE
             C
             C CONVERT BEAM FORCES TO MASS AXES AND REVERSE SIGNS TO GET
             C FORCES ACTING ON MASSES.  USE TRANSPOSE OF AIJTAJ OR AIJTAI.
             C
ISN 0896          IF (IJPR(IJ).NE.0) GO TO 6210
ISN 0898          T1 = -FSI(1)
ISN 0899          T2 = -FSI(2)
ISN 0900          T3 = -FSI(3)
ISN 0901          FSI(1) = AIJTAI(1)*T1+AIJTAI(2)*T2+AIJTAI(3)*T3
ISN 0902          FSI(2) = AIJTAI(4)*T1+AIJTAI(5)*T2+AIJTAI(6)*T3
ISN 0903          FSI(3) = AIJTAI(7)*T1+AIJTAI(8)*T2+AIJTAI(9)*T3
ISN 0904          T1 = -FSI(4)
ISN 0905          T2 = -FSI(5)
ISN 0906          T3 = -FSI(6)
ISN 0907          FSI(4) = AIJTAI(1)*T1+AIJTAI(2)*T2+AIJTAI(3)*T3
ISN 0908          FSI(5) = AIJTAI(4)*T1+AIJTAI(5)*T2+AIJTAI(6)*T3
ISN 0909          FSI(6) = AIJTAI(7)*T1+AIJTAI(8)*T2+AIJTAI(9)*T3
ISN 0910     6210 IF(J.EQ.81) GO TO 6200
ISN 0912          T1 = -FSJ(1)
ISN 0913          T2 = -FSJ(2)
ISN 0914          T3 = -FSJ(3)
ISN 0915          FSJ(1) = AIJTAJ(1)*T1+AIJTAJ(2)*T2+AIJTAJ(3)*T3
ISN 0916          FSJ(2) = AIJTAJ(4)*T1+AIJTAJ(5)*T2+AIJTAJ(6)*T3
ISN 0917          FSJ(3) = AIJTAJ(7)*T1+AIJTAJ(8)*T2+AIJTAJ(9)*T3
ISN 0918          T1 = -FSJ(4)
ISN 0919          T2 = -FSJ(5)
ISN 0920          T3 = -FSJ(6)
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ISN 0921          FSJ(4) = AIJTAJ(1)*T1+AIJTAJ(2)*T2+AIJTAJ(3)*T3
ISN 0922          FSJ(5) = AIJTAJ(4)*T1+AIJTAJ(5)*T2+AIJTAJ(6)*T3
ISN 0923          FSJ(6) = AIJTAJ(7)*T1+AIJTAJ(8)*T2+AIJTAJ(9)*T3
ISN 0924     6200 CONTINUE
            C
            C     TO GET THE BEAM MOMENTS AT MASS J,WE MUST ACCOUNT FOR THE
            C     MOMENTS DUE TO THE BEAM FORCES AT NODE POINT (J,N), WHICH
            C     IS OFFSET FROM MASS J BY THE VECTOR (RX,RY,RZ). THESE VECTOR
            C     ELEMENTS ARE SUBSCRIPTED BY NODE POINT, FROM 1 TO NNP, AND
            C     ARE IN MASS J AXES.
            C
ISN 0925          IF(N.EQ.0.OR.J.EQ.81) GO TO 3410
            C
            C  MOMENTS AT J, MASS J AXES.
            C
ISN 0927          FSJ(4) = FSJ(4) + FSJ(3)*RY(JJ) - FSJ(2)*RZ(JJ)
ISN 0928          FSJ(5) = FSJ(5) - FSJ(3)*RX(JJ) + FSJ(1)*RZ(JJ)
ISN 0929          FSJ(6) = FSJ(6) + FSJ(2)*RX(JJ) - FSJ(1)*RY(JJ)
ISN 0930     3410 CONTINUE
            C
            C  MOMENTS AT I, MASS I AXES.  SKIP FOR DRI ELEMENTS.
            C
ISN 0931          IF(IJPR(IJ).NE.0) GO TO 264
ISN 0933          IF(M.EQ.0) GO TO 266
ISN 0935          FSI(4) = FSI(4) + FSI(3)*RY(JI) - FSI(2)*RZ(JI)
ISN 0936          FSI(5) = FSI(5) - FSI(3)*RX(JI) + FSI(1)*RZ(JI)
ISN 0937          FSI(6) = FSI(6) + FSI(2)*RX(JI) - FSI(1)*RY(JI)
ISN 0938          GO TO 266
ISN 0939      264 DO 265 JJJ=1,6
ISN 0940          FSI(JJJ) = 0.
ISN 0941      265 CONTINUE
            C
            C     FOR SYMFLG = 1.,WE LATER DOUBLE ALL XZ AND M INTERNAL
            C     AND DAMPING LOADS ACTING ON A MASS ON THE AIRPLANE
            C     PLANE OF SYMMETRY. SINCE WE DO THIS FOR ALL BEAMS,
            C     HERE WE MUST HALVE THE LOADS FOR BEAMS THAT LIE
            C     ENTIRELY IN THE PLANE OF SYMMETRY,SINCE THESE LOADS
            C     SHOULD NOT BE DOUBLED. CLTEST(IJ) IS NE ZERO FOR THIS
            C     CONDITION.
            C
ISN 0942      266 CONTINUE
ISN 0943          IF(SYMFLG.NE.1.OR.CLTEST(IJ).EQ.0.) GO TO 5001
ISN 0945          DO 5002 JJJ=1,6
ISN 0946          FSJ(JJJ) = FSJ(JJJ)/2.
ISN 0947          FSI(JJJ) = FSI(JJJ)/2.
ISN 0948     5002 CONTINUE
            C
            C  NOW SUM FORCES AT MASSES I AND J.  SUMMING OVER BEAMS.
            C
ISN 0949     5001 XX(I) = XX(I) + FSI(1)
ISN 0950          XY(I) = XY(I) + FSI(2)
ISN 0951          XZ(I) = XZ(I) + FSI(3)
ISN 0952          XL(I) = XL(I) + FSI(4)
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      XM(I) = XM(I) + FSI(5)
      XN(I) = XN(I) + FSI(6)
      IF(J.EQ.81) GO TO 1000
      XX(J) = XX(J) + FSJ(1)
      XY(J) = XY(J) + FSJ(2)
      XZ(J) = XZ(J) + FSJ(3)
      XL(J) = XL(J) + FSJ(4)
      XM(J) = XM(J) + FSJ(5)
      XN(J) = XN(J) + FSJ(6)
 1000 CONTINUE
C
C     END OF MAIN INTERNAL BEAM IJ LOOP.
C
      IS=9*(MVP-1)
      DO 1010 KS=1,9
      IS=IS+1
 1010 AP(KS)=BIJ(IS)
C FINISH COMPUTING DERIVATIVES
C      SET COUNTER=0 FOR ACCEL PULSE
      NPTSP=0
      NPTS=0
      DO 2000 I = 1,NM
      IS = 9*(I-1)
      DO 330 KS = 1,9
      IS = IS+1
      AIDOT(KS) = CIJ(IS)
  330 AI(KS) = BIJ(IS)
C DO CRASH FORCES
      DO 460 J1=1,6
      XC(J1) = 0.
  460 CONTINUE
      DO 340 IKM=1,NSP
      IF(I.EQ.II(IKM)) GO TO 400
  340 CONTINUE
      GO TO 440
  400 CALL CFORCE
C (20),(23),(24)
  440 XA = WGT(I)-ALIFT(I)*WTOT
      SX = XX(I)+XA*AI(3)+XC(1)
      SY = XY(I)+XA*AI(6)+XC(2)
      SZ = XZ(I)+XA*AI(9)+XC(3)
      SL = XL(I)+XC(4)
      SM = XM(I)+XC(5)
      SN = XN(I)+XC(6)
C
C     IF WE HAVE A SYMMETRIC CASE (SYMFLG.NE.0) AND THE MASS WE ARE
C     CONSIDERING IS ON THE AIRPLANE CENTERLINE (YDP(I)=0),THEN WE
C     MUST CORRECT THE TOTAL FORCES AND MOMENTS TO ACCOUNT FOR THE
C     BEAMS ON THE OTHER SIDE,NOT CALCULATED,THAT CONNECT TO THIS MASS.
C
      IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 1011
      SY = 0.
      SL = 0.
```

```
      SN = 0.                                                           00012600
      IF(SYMFLG.EQ.2.) GO TO 1011                                       00012610
      SX = SX+XX(I)                                                     00012620
      SZ = SZ+XZ(I)                                                     00012630
      SM = SM+XM(I)                                                     00012640
C GET P,Q,R,U,V,W                                                        00012650
 1011 PP = P(I)                                                         00012660
      QQ = Q(I)                                                         00012670
      RR = R(I)                                                         00012680
      UU = U(I)                                                         00012690
      VV = V(I)                                                         00012700
      WW = W(I)                                                         00012710
C MASS                                                                  00012720
      ZM=386.0/WGT(I)                                                   00012730
      IF(TIME.NE.0.) GO TO 343                                          00012740
      XACF(I) = XACC(I)                                                 00012750
      YACF(I) = YACC(I)                                                 00012760
      ZACF(I) = ZACC(I)                                                 00012770
C     TEMP CALCS                                                        00012780
      XACF(I)=0.                                                        00012790
      YACF(I)=0.                                                        00012800
      ZACF(I)=0.                                                        00012810
C (25)                                                                  00012820
  343 UDOTI = UDOT(I)                                                   00012830
      VDOTI = VDOT(I)                                                   00012840
      WDOTI = WDOT(I)                                                   00012850
      UDOT(I)=SX*ZM-QQ*WW+RR*VV                                         00012860
      VDOT(I)=SY*ZM-RR*UU+PP*WW                                         00012870
      WDOT(I)=SZ*ZM-PP*VV+QQ*UU                                         00012880
      IF(NACC.EQ.0) GO TO 341                                           00012890
      CALL ACCELT(I,UDOT(I),VDOT(I),WDOT(I),PDOT(I),QDOT(I),RDOT(I),    00012900
     1TIME,NPTSP,NPTS)                                                  00012910
      NPTSP=NPTS                                                        00012920
  341 XACC(I)=(UDOT(I)+QQ*WW-RR*VV)/386.                                00012930
      YACC(I)=(VDOT(I)+RR*UU-PP*WW)/386.                                00012940
      ZACC(I)=(WDOT(I)+PP*VV-QQ*UU)/386.                                00012950
      XACFDI = XACFD(I)                                                 00012960
      YACFDI = YACFD(I)                                                 00012970
      ZACFDI = ZACFD(I)                                                 00012980
      IF(PFIL.EQ.0.) GO TO 344                                          00012990
      XACFD(I) = (XACC(I)-XACF(I))/PFIL                                 00013000
      YACFD(I) = (YACC(I)-YACF(I))/PFIL                                 00013010
      ZACFD(I) = (ZACC(I)-ZACF(I))/PFIL                                 00013020
      GO TO 345                                                         00013030
  344 XACFD(I) = 0.                                                     00013040
      YACFD(I) = 0.                                                     00013050
      ZACFD(I) = 0.                                                     00013060
C (26)                                                                  00013070
  345 T1 = -XZI(I)*PP-YZI(I)*QQ+ZI(I)*RR+HEZ(I)                         00013080
      T2 = XI(I)*PP-XYI(I)*QQ-XZI(I)*RR+HEX(I)                          00013090
      T3 = -XYI(I)*PP+YI(I)*QQ-YZI(I)*RR+HEY(I)                         00013100
      SL = SL-QQ*T1+RR*T3                                               00013110
      SM = SM-RR*T2+PP*T1                                               00013120
```

```
      SN = SN-PP*T3+QQ*T2
C (25)
      DEL = DELI(I)
      PDOTI = PDOT(I)
      PDOT(I) = DEL*(SL*XI1(I)+SM*XI2(I)+SN*XI3(I))
      QDOTI = QDOT(I)
      QDOT(I) = DEL*(SL*XI2(I)+SM*XI5(I)+SN*XI4(I))
      RDOTI = RDOT(I)
      RDOT(I) = DEL*(SL*XI3(I)+SM*XI4(I)+SN*XI6(I))
C
C     FOR A SYMMETRICAL CASE,CONSTRAIN THE ACCELERATIONS OF THE
C     CENTERLINE MASSES.
C
      IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 342
      VDOT(I) = 0.
      PDOT(I) = 0.
      RDOT(I) = 0.
  342 XDOTI = XDOT(I)
      YDOTI = YDOT(I)
      ZDOTI = ZDOT(I)
      PHDOTI = PHIDOT(I)
      THDOTI = THEDOT(I)
      PSDOTI = PSIDOT(I)
      IF(TIME) 1900,1900,300
C
C     ...VARIABLE INTEGRATION ADDED  11/09/77  DHS...
C
  300 UP = U(I)
      U(I) = TT*U(I)+ET*(UOLD(I)+DTHALF*(UDOT(I)+UDOTI))
      ERR = AMAX1(ERR,
     1(ABS(UDOT(I)-UDOTI)*DELTAT)/
     2         AMAX1(ABS(UOLD(I))+ABS(U(I)-UOLD(I)),1.D-06))
C
C
      VP = V(I)
      V(I) = TT*V(I)+ET*(VOLD(I)+DTHALF*(VDOT(I)+VDOTI))
      ERR = AMAX1(ERR,
     1(ABS(VDOT(I)-VDOTI)*DELTAT)/
     2         AMAX1(ABS(VOLD(I))+ABS(V(I)-VOLD(I)),1.D-06))
C
C
      WP = W(I)
      W(I) = TT*W(I)+ET*(WOLD(I)+DTHALF*(WDOT(I)+WDOTI))
      ERR = AMAX1(ERR,
     1(ABS(WDOT(I)-WDOTI)*DELTAT)/
     2         AMAX1(ABS(WOLD(I))+ABS(W(I)-WOLD(I)),1.D-06))
C
C
      PP = P(I)
      P(I) = TT*P(I)+ET*(POLD(I)+DTHALF*(PDOT(I)+PDOTI))
      ERR = AMAX1(ERR,
     1(ABS(PDOT(I)-PDOTI)*DELTAT)/
     2         AMAX1(ABS(POLD(I))+ABS(P(I)-POLD(I)),1.D-06))
```

AD-A055 898 LOCKHEED-CALIFORNIA CO BURBANK F/G 1/2
GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MAN--ETC(U)
FEB 78 M A GAMON DOT-FA75WA-3707
UNCLASSIFIED LR-28307 FAA/RD-77/189-VOL-1 NL

3 OF 7
AD A
055 898

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                C
                C
ISN 1079              QP = Q(I)
ISN 1080              Q(I) = TT*Q(I)+ET*(QOLD(I)+DTHALF*(QDOT(I)+QDOTI))
ISN 1081              ERR = AMAX1(ERR,
                     1(ABS(QDOT(I)-QDOTI)*DELTAT)/
                     2        AMAX1(ABS(QOLD(I))+ABS(Q(I)-QOLD(I)),1.D-06))
                C
                C
ISN 1082              RP = R(I)
ISN 1083              R(I) = TT*R(I)+ET*(ROLD(I)+DTHALF*(RDOT(I)+RDOTI))
ISN 1084              ERR = AMAX1(ERR,
                     1(ABS(RDOT(I)-RDOTI)*DELTAT)/
                     2        AMAX1(ABS(ROLD(I))+ABS(R(I)-ROLD(I)),1.D-06))
                C
                C     CHANGE ERR DEFINITION FOR ENERGY BASED VARIABLE DT SCHEME.
                C
ISN 1085              IF(IVAR.EQ.2) ERR=DEVMAX*TMAX/TIME
ISN 1087              X(I) = TT*X(I)+ET*(XOLD(I)+DTHALF*(XDOT(I)+XDOTI))
ISN 1088              Y(I) = TT*Y(I)+ET*(YOLD(I)+DTHALF*(YDOT(I)+YDOTI))
ISN 1089              Z(I) = TT*Z(I)+ET*(ZOLD(I)+DTHALF*(ZDOT(I)+ZDOTI))
ISN 1090              PHI(I) = TT*PHI(I)+ET*(PHIOLD(I)+DTHALF*(PHIDOT(I)+PHDOTI))
ISN 1091              THETA(I) = TT*THETA(I)+ET*(THEOLD(I)+DTHALF*(THEDOT(I)+THDOTI))
ISN 1092              PSI(I) = TT*PSI(I)+ET*(PSIOLD(I)+DTHALF*(PSIDOT(I)+PSDOTI))
ISN 1093              PIN(I) = TT*PIN(I)+ET*(PINO(I)+DTHALF*(P(I)+POLD(I)))
ISN 1094              QIN(I) = TT*QIN(I)+ET*(QINO(I)+DTHALF*(Q(I)+QOLD(I)))
ISN 1095              RIN(I) = TT*RIN(I)+ET*(RINO(I)+DTHALF*(R(I)+ROLD(I)))
                C
                C     XACI ETC ARE MASS IMPULSE CALCS 2-5-79
                C
ISN 1096              XACI=XACF(I)
ISN 1097              YACI=YACF(I)
ISN 1098              ZACI=ZACF(I)
ISN 1099              XACF(I) = TT*XACF(I)+ET*(XAFOLD(I)+DTHALF*(XACFD(I)+XACFDI))
ISN 1100              YACF(I) = TT*YACF(I)+ET*(YAFOLD(I)+DTHALF*(YACFD(I)+YACFDI))
ISN 1101              ZACF(I) = TT*ZACF(I)+ET*(ZAFOLD(I)+DTHALF*(ZACFD(I)+ZACFDI))
ISN 1102              XIMP(I)=TT*XIMP(I)+ET*(XIMPOL(I)+DTHALF*(XACF(I)+XACI))
ISN 1103              YIMP(I)=TT*YIMP(I)+ET*(YIMPOL(I)+DTHALF*(YACF(I)+YACI))
ISN 1104              ZIMP(I)=TT*ZIMP(I)+ET*(ZIMPOL(I)+DTHALF*(ZACF(I)+ZACI))
ISN 1105              IF ((IPENSW(I).NE.0).OR.(I.EQ.MVP).OR.(MVP.EQ.0)) GO TO 1900
                C
                C        CONTROL VOLUME PENETRATION CALCULATIONS
                C
ISN 1107              TP1=X(I)-X(MVP)
ISN 1108              TP2=Y(I)-Y(MVP)
ISN 1109              TP3=Z(I)-Z(MVP)
ISN 1110              XPI=AP(1)*TP1+AP(2)*TP2+AP(3)*TP3
ISN 1111              YPI=AP(4)*TP1+AP(5)*TP2+AP(6)*TP3
ISN 1112              ZPI=AP(7)*TP1+AP(8)*TP2+AP(9)*TP3
ISN 1113              IF ((-XNBAR.GT.XPI).OR.(XPI.GT.XPBAR))  GO TO 1900
ISN 1115              IF ((-YNBAR.GT.YPI).OR.(YPI.GT.YPBAR))  GO TO 1900
ISN 1117              IF ((-ZNBAR.GT.ZPI).OR.(ZPI.GT.ZPBAR))  GO TO 1900
ISN 1119              KPEN=KPEN+1
```

```
ISN 1120          IPEN(KPEN)=I                                              00014190
ISN 1121          TPEN(KPEN)=TIME                                           00014200
ISN 1122          IPENSW(I)=1                                               00014210
ISN 1123          PRINT 1080, I,TIME                                        00014220
ISN 1124     1080 FORMAT(1H0,' CONTROL VOLUME PENETRATED BY MASS ',I2,', TIME=',  00014230
                 1 F10.5)                                                   00014240
            C                                                               00014250
            C     ZERO XCE AND XFE FOR ALL I'S PRIOR TO ENERGY CALCS BELOW. 00014260
            C                                                               00014270
ISN 1125     1900 XCE(I) = 0.                                               00014280
ISN 1126          XFE(I) = 0.                                               00014290
ISN 1127     2000 CONTINUE                                                  00014300
ISN 1128          IF(NNP.EQ.0) GO TO 2008                                   00014310
            C                                                               00014320
            C     NOW CALCULATE THE VELOCITIES AND ACCELERATIONS OF THE NODE 00014330
            C     POINTS. THESE ARE USED ONLY FOR OUTPUT DATA.              00014340
            C                                                               00014350
ISN 1130          DO 4000 J=1,NNP                                           00014360
ISN 1131          I = INP(J)                                                00014370
ISN 1132          OMCRX = -R(I)*RY(J)+Q(I)*RZ(J)                            00014380
ISN 1133          OMCRY =  R(I)*RX(J)-P(I)*RZ(J)                            00014390
ISN 1134          OMCRZ = -Q(I)*RX(J)+P(I)*RY(J)                            00014400
ISN 1135          OMCCRX = -R(I)*OMCRY+Q(I)*OMCRZ                           00014410
ISN 1136          OMCCRY =  R(I)*OMCRX-P(I)*OMCRZ                           00014420
ISN 1137          OMCCRZ = -Q(I)*OMCRX+P(I)*OMCRY                           00014430
ISN 1138          UNP(J) = U(I)+OMCRX                                       00014440
ISN 1139          VNP(J) = V(I)+OMCRY                                       00014450
ISN 1140          WNP(J) = W(I)+OMCRZ                                       00014460
ISN 1141          IS = 9*(I-1)                                              00014470
ISN 1142          DO 4010 KS=1,9                                            00014480
ISN 1143          IS = IS+1                                                 00014490
ISN 1144          AI(KS) = BIJ(IS)                                          00014500
ISN 1145     4010 CONTINUE                                                  00014510
ISN 1146          TX = AI(1)*RX(J)+AI(4)*RY(J)+AI(7)*RZ(J)                  00014520
ISN 1147          TY = AI(2)*RX(J)+AI(5)*RY(J)+AI(8)*RZ(J)                  00014530
ISN 1148          TZ = AI(3)*RX(J)+AI(6)*RY(J)+AI(9)*RZ(J)                  00014540
ISN 1149          XNP(J) = X(I)+TX                                          00014550
ISN 1150          YNP(J) = Y(I)+TY                                          00014560
ISN 1151          ZNP(J) = Z(I)+TZ                                          00014570
ISN 1152          XDNP(J) = AI(1)*UNP(J)+AI(4)*VNP(J)+AI(7)*WNP(J)          00014580
ISN 1153          YDNP(J) = AI(2)*UNP(J)+AI(5)*VNP(J)+AI(8)*WNP(J)          00014590
ISN 1154          ZDNP(J) = AI(3)*UNP(J)+AI(6)*VNP(J)+AI(9)*WNP(J)          00014600
ISN 1155          ACX = -RDOT(I)*RY(J)+QDOT(I)*RZ(J)                        00014610
ISN 1156          ACY =  RDOT(I)*RX(J)-PDOT(I)*RZ(J)                        00014620
ISN 1157          ACZ = -QDOT(I)*RX(J)+PDOT(I)*RY(J)                        00014630
ISN 1158          XACCNP(J) = XACC(I)+(ACX+OMCCRX)/386.                     00014640
ISN 1159          YACCNP(J) = YACC(I)+(ACY+OMCCRY)/386.                     00014650
ISN 1160          ZACCNP(J) = ZACC(I)+(ACZ+OMCCRZ)/386.                     00014660
ISN 1161          IF(TIME.NE.0.) GO TO 4020                                 00014670
ISN 1163          XACNPF(J) = XACCNP(J)                                     00014680
ISN 1164          YACNPF(J) = YACCNP(J)                                     00014690
ISN 1165          ZACNPF(J) = ZACCNP(J)                                     00014700
ISN 1166     4020 XNPFDJ = XNPFD(J)                                         00014710
```

```
ISN 1167        YNPFDJ = YNPFD(J)
ISN 1168        ZNPFDJ = ZNPFD(J)
ISN 1169        IF(PFIL.EQ.0.) GO TO 4030
ISN 1171        XNPFD(J) = (XACCNP(J)-XACNPF(J))/PFIL
ISN 1172        YNPFD(J) = (YACCNP(J)-YACNPF(J))/PFIL
ISN 1173        ZNPFD(J) = (ZACCNP(J)-ZACNPF(J))/PFIL
ISN 1174        GO TO 4050
ISN 1175   4030 XNPFD(J) = 0.
ISN 1176        YNPFD(J) = 0.
ISN 1177        ZNPFD(J) = 0.
ISN 1178   4050 IF(TIME) 4000,4000,4040
          C     XACNPI,XIMNP(I) ETC ARE MASS NODE POINT IMPULSE CALCS 2-5-79
          C
ISN 1179   4040 XACNPI=XACNPF(J)
ISN 1180        YACNPI=YACNPF(J)
ISN 1181        ZACNPI=ZACNPF(J)
ISN 1182        XACNPF(J)=TT*XACNPF(J)+ET*(XANPFO(J)+DTHALF*(XNPFD(J)+XNPFDJ))
ISN 1183        YACNPF(J) = TT*YACNPF(J)+ET*(YANPFO(J)+DTHALF*(YNPFD(J)+YNPFDJ))
ISN 1184        ZACNPF(J) = TT*ZACNPF(J)+ET*(ZANPFO(J)+DTHALF*(ZNPFD(J)+ZNPFDJ))
ISN 1185        XIMPNP(J)=TT*XIMPNP(J)+ET*(XIMNPL(J)+DTHALF*(XACNPF(J)
               1 +XACNPI))
ISN 1186        YIMPNP(J)=TT*YIMPNP(J)+ET*(YIMNPL(J)+DTHALF*(YACNPF(J)
               1 +YACNPI))
ISN 1187        ZIMPNP(J)=TT*ZIMPNP(J)+ET*(ZIMNPL(J)+DTHALF*(ZACNPF(J)
               1 +ZACNPI))
ISN 1188   4000 CONTINUE
          C
          C     ...CHECK INTEGRATION ERROR AND VARY DELTAT IF NECESSARY...
          C
ISN 1189   2008 CONTINUE
ISN 1190        IF (IVAR .EQ. 0) GO TO 2010
ISN 1192        IF (TIME) 2010,2010,2015
ISN 1193   2015 DELTA = 0.
ISN 1194        DT2 = 2. * DELTAT
ISN 1195        IF (ERR .LT. EL) DELTA = RATMAX
ISN 1197        IF ((ERR .GT. EU) .AND. (DELTAT .GT. MINDT))  DELTA = RATMIN
ISN 1199        IF ((DELTA.EQ.0.) .AND. (IPC.EQ.1))   DELTA = 1.0
ISN 1201        IF (DELTA .EQ. 0.) GO TO 2010
ISN 1203          IF (IPC .NE. 1.) GO TO 2019
ISN 1205            TREL = DMOD(TIME+DELTAT,TPRINT)
ISN 1206            TLEFT = TPRINT - TREL
ISN 1207            MPTSP = (TLEFT/DELTAT) + .5
ISN 1208            DELT1 = TLEFT / MPTSP
ISN 1209            IPRIN1 = MPTSP + IPC + 1
ISN 1210            GO TO 2018
ISN 1211   2019     MPTS = IPRINT - IPC
ISN 1212            IF ((MPTS.EQ.0) .OR. (MPTS.EQ.1)) GO TO 2010
ISN 1214            TREL = DMOD(TIME+DELTAT,TPRINT)
ISN 1215            TLEFT = TPRINT - TREL
ISN 1216            MPTSP = ((MPTS-1)/DELTA)  + .5
ISN 1217            DELT1 = TLEFT / MPTSP
ISN 1218            IPRIN1 = IPC + MPTSP+ 1
ISN 1219   2018     DTX = DELT1 - DELTAT
```

```
ISN 1220         IF (DTX .EQ. 0.) GO TO 2010                                    00015250
ISN 1222           TIME1 = TIME                                                 00015260
ISN 1223           DT2 = DELTAT + DELT1                                         00015270
ISN 1224           DELTAT = DELT1                                               00015280
ISN 1225           DTHALF = .5 * DELTAT                                         00015290
ISN 1226           IPRINT = IPRIN1                                              00015300
           C                                                                    00015310
           C      ENERGY CALCULATIONS BY MASS.  CEIK AND CEIKF ALREADY SUMMED OVER 00015320
           C      TIME.  NOW SUM OVER SPRINGS FOR GIVEN MASS.                   00015330
           C                                                                    00015340
ISN 1227    2010 DO 2011 IKM=1,NSP                                              00015350
ISN 1228          I = II(IKM)                                                   00015360
ISN 1229          XCE(I) = XCE(I) + CEIK(IKM)                                   00015370
ISN 1230          XFE(I) = XFE(I) + CEIKF(IKM)                                  00015380
ISN 1231    2011 CONTINUE                                                       00015390
           C                                                                    00015400
           C      SET ZINIT(I)=Z(I) AT TIME=0                                   00015410
           C                                                                    00015420
ISN 1232          IF(TIME.NE.0.) GO TO 2012                                     00015430
ISN 1234          DO 2014 I=1,NM                                                00015440
ISN 1235          ZINIT(I)=Z(I)                                                 00015450
ISN 1236    2014 CONTINUE                                                       00015460
ISN 1237    2012 XETOTL = 0.                                                    00015470
ISN 1238          KETOTL = 0.                                                   00015480
ISN 1239          PETOTL = 0.                                                   00015490
ISN 1240          SETOTL = 0.                                                   00015500
ISN 1241          DETOTL = 0.                                                   00015510
ISN 1242          CETOTL = 0.                                                   00015520
ISN 1243          FETOTL = 0.                                                   00015530
ISN 1244          DEVMAX = 0.                                                   00015540
ISN 1245          DO 2016 I = 1,NM                                              00015550
           C*****DON'T USE AN I IF IT'S = TO A J OF A DRI I,J PAIR              00015560
ISN 1246          DO 2017 IJ = 1,NB                                             00015570
ISN 1247          IF(IJPR(IJ).EQ.0) GO TO 2017                                  00015580
ISN 1249          IF(I.NE.JG(IJ)) GO TO 2017                                    00015590
ISN 1251          PEI(I) = 0.0                                                  00015600
ISN 1252          KEI(I) = 0.0                                                  00015610
ISN 1253          GO TO 2020                                                    00015620
ISN 1254    2017 CONTINUE                                                       00015630
ISN 1255          PEI(I) = -WGT(I)*Z(I)+ALIFT(I)*WTOT*(Z(I)-ZINIT(I))           00015640
ISN 1256          KEI(I) = .5*(WGT(I)*(U(I)*U(I)+V(I)*V(I)+W(I)*W(I))/386.0     00015650
                1 +P(I)*(P(I)* XI(I)+Q(I)*XYI(I)+R(I)*XZI(I))                  00015660
                2 +Q(I)*(P(I)*XYI(I)+Q(I)* YI(I)+R(I)*YZI(I))                  00015670
                3 +R(I)*(P(I)*XZI(I)+Q(I)*YZI(I)+R(I)* ZI(I)))                 00015680
           C                                                                    00015690
           C      FOR A SYMMETRICAL MODEL WE MUST ADD KE AND PE CONTRIBUTIONS   00015700
           C      FROM THE OPPOSITE MASSES THAT ARE NOT INPUT EXPLICITLY.       00015710
           C                                                                    00015720
ISN 1257          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020                    00015730
ISN 1259          PEI(I) = 2.*PEI(I)                                            00015740
ISN 1260          KEI(I) = 2.*KEI(I)                                            00015750
ISN 1261    2020 XETOT(I) = KEI(I)+PEI(I)+XSE(I)+XDE(I)+XCE(I)+XFE(I)           00015760
           C                                                                    00015770
```

```
          C     SUM OVER MASSES TO CHECK WITH OTHER ENERGY PRINT.
          C
ISN 1262        KETOTL = KETOTL + KEI(I)
ISN 1263        PETOTL = PETOTL + PEI(I)
ISN 1264        SETOTL = SETOTL + XSE(I)
ISN 1265        DETOTL = DETOTL + XDE(I)
ISN 1266        CETOTL = CETOTL + XCE(I)
ISN 1267        FETOTL = FETOTL + XFE(I)
ISN 1268        XETOTL = XETOTL + XETOT(I)
ISN 1269        IF(TIME.NE.0.) GO TO 2024
ISN 1271        XETOTO(I) = XETOT(I)
ISN 1272   2024 IF(XETOTO(I).NE.0) GO TO 2022
ISN 1274        XPCT(I) = 100.
ISN 1275        GO TO 2030
ISN 1276   2022 XPCT(I) = XETOT(I)/XETOTO(I)*100.
ISN 1277   2030 DEV = ABS(XPCT(I)-100.)
ISN 1278        DEVMAX = AMAX1(DEVMAX,DEV)
ISN 1279   2016 CONTINUE
          C
          C     VOLUME CHANGE CALCULATIONS
          C
ISN 1280        IF(NVCH) 2001,2001,2002
ISN 1281   2002 FLIP = 0.
ISN 1282        DO 2003 MI=1,NVCH
ISN 1283        VOL(MI) = 1.
ISN 1284        DO 2004 I=1,6
ISN 1285        SUMX = 0.
ISN 1286        SUMY = 0.
ISN 1287        SUMZ = 0.
          C
          C     EACH ROW OF KMATR CONTAINS THE FOUR CORNER NUMBERS FOR THE
          C     APPROPRIATE SIDE OF THE CUBE
          C
          C     EACH ROW OF INBUFF CONTAINS THE ACTUAL MASS NUMBERS FOR THE
          C     EIGHT CORNERS OF THE VOLUME
          C
ISN 1288        DO 2005 J=1,4
ISN 1289        K = KMATR(I,J)
ISN 1290        L = INBUFF(MI,K)
          C
          C     FOR A SYMMETRICAL MODEL THE MASS NUMBER L MAY BE 0,SO WE USE
          C     THE MASS NUMBER FOR CORNER (K-1) AND CHANGE THE SIGN OF THE Y
          C     COORDINATE.SEE PG. 1-66 OF LR27699,KRASH USERS MANUAL.
          C
ISN 1291        IF(L.NE.0) GO TO 2100
ISN 1293        L = INBUFF(MI,K-1)
ISN 1294        Y(L) = -Y(L)
ISN 1295        FLIP = 1.
ISN 1296   2100 SUMX = SUMX + X(L)
ISN 1297        SUMY = SUMY + Y(L)
ISN 1298        SUMZ = SUMZ + Z(L)
ISN 1299        IF(FLIP.NE.1.) GO TO 2005
ISN 1301        Y(L) = -Y(L)
```

```
ISN 1302          FLIP = 0.                                                   00016310
ISN 1303     2005 CONTINUE                                                    00016320
ISN 1304          XVOL(I,1) = SUMX/4.D0                                       00016330
ISN 1305          XVOL(I,2) = SUMY/4.D0                                       00016340
ISN 1306          XVOL(I,3) = SUMZ/4.D0                                       00016350
ISN 1307     2004 CONTINUE                                                    00016360
             C    NOW WE HAVE THE XYZ COORDINATES OF THE CENTERS OF THE SIX  00016370
             C    SIDES OF VOLUME M                                           00016380
ISN 1308          DO 2006 I=1,3                                               00016390
ISN 1309          SUM = 0.                                                    00016400
ISN 1310          DO 2007 J=1,3                                               00016410
ISN 1311          DXVOL = XVOL(2*I,J) - XVOL(2*I-1,J)                         00016420
ISN 1312          SUM = SUM + DXVOL*DXVOL                                     00016430
ISN 1313     2007 CONTINUE                                                    00016440
ISN 1314          VOLLEN(MI,I) = SQRT(SUM)                                    00016450
ISN 1315          DLVOL(MI,I) = VOLLEN(MI,I)-VOLENZ(MI,I)                     00016460
ISN 1316          VOL(MI) = VOL(MI)*VOLLEN(MI,I)                              00016470
ISN 1317     2006 CONTINUE                                                    00016480
ISN 1318     2003 CONTINUE                                                    00016490
ISN 1319     2001 RETURN                                                      00016500
ISN 1320          END                                                         00016510
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*                                                                              *
*                                                                              *
*                                                                              *
*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.        *
*                                                                              *
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        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                           SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334DOAIJ AT LEVEL 001 AS OF 04/28/78
              C          DATA SET D2332VDO   AT LEVEL 001 AS OF 02/03/78
              C          DATA SET D2332RDO   AT LEVEL 002 AS OF 06/21/77
  ISN 0002             SUBROUTINE DOAIJ
              C
  ISN 0003             IMPLICIT REAL*8 (A-H,O-Z)
  ISN 0004             REAL*8 KUN
  ISN 0005             INTEGER*4 TITLE(40)
  ISN 0006             INTEGER*2 N1,NN
  ISN 0007             INTEGER*2 IJPR,IG,JG,MG(150),NG(150),INP(50),MNP(50)
  ISN 0008             DIMENSION SINCOS(6),XTHOLD(9,2),XYZIJI(9),XYZIJJ(9),PROD(9),
                      1 XIIJ(3)
  ISN 0009             DIMENSION XK3(6,6,150)
  ISN 0010             DIMENSION XMAS(6),FREQ(6),TEMP(9),SUMM(9),AIJTAI(9),AIJTAJ(9)
  ISN 0011             DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)
  ISN 0012             DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)
  ISN 0013             DIMENSION XXII(3),XXIJ(3)
  ISN 0014             DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50),PHIIJ0(150),THEIJ0(150),
                      1 PSIIJ0(150)
  ISN 0015             COMMON/DOIN/ CBAR(150)
  ISN 0016             COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),
                      1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,
                      2 XGDOT,YGDOT,ZGDOT
  ISN 0017             COMMON/INIDCP/ YDP(80)
  ISN 0018             COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
  ISN 0019             COMMON/NP00I4/ NNP
  ISN 0020             COMMON/NP00I2/ MG,NG,INP,MNP
  ISN 0021             COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,
                      1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)
  ISN 0022             COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                      1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                      2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                      3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                      4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                      5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                      6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                      7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                      8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                      9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                      A CEIKF(40),
                      B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
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                 C NM,NB,I,J,IG(150),JG(150),
                 D N1(900),NN(40),I.PR(150)
ISN 0023           EQUIVALENCE (XTHOLD(1,1),XYZIJI(1)),(XTHOLD(1,2),XYZIJJ(1))
ISN 0024           EQUIVALENCE (S1,SINCOS(1)),(C1,SINCOS(2)),(S2,SINCOS(3))
ISN 0025           EQUIVALENCE (C2,SINCOS(4)),(S3,SINCOS(5)),(C3,SINCOS(6))
ISN 0026           EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0027           SIN(X) = DSIN(X)
ISN 0028           COS(X) = DCOS(X)
ISN 0029           SQRT(X) = DSQRT(X)
ISN 0030           ATAN2(Y,X) = DATAN2(Y,X)
ISN 0031           PI = 3.14159265358979324D0
ISN 0032           IOLD=0
ISN 0033           DO 1100 I = 1,NM
ISN 0034           ARG=PHIDP(I)
ISN 0035           S1=SIN(ARG)
ISN 0036           C1=COS(ARG)
ISN 0037           ARG=THEDP(I)
ISN 0038           S2=SIN(ARG)
ISN 0039           C2=COS(ARG)
ISN 0040           ARG=PSIDP(I)
ISN 0041           S3=SIN(ARG)
ISN 0042           C3=COS(ARG)
ISN 0043           DO 1085 J = 1,6
ISN 0044           T=SINCOS(J)
ISN 0045           IF (T) 1070,1085,1075
ISN 0046      1070 T=-T
ISN 0047      1075 IF(T-1.E-10) 1080,1085,1085
ISN 0048      1080 SINCOS(J)=0.
ISN 0049      1085 CONTINUE
ISN 0050           J=9*(I-1)
              C MOVE AI'S TO OLD AI'S
ISN 0051           DO 1090 J2 = 1,9
ISN 0052      1090 OAI(J+J2)=BIJ(J+J2)
ISN 0053           S1S2=S1*S2
ISN 0054           C1S2=C1*S2
ISN 0055           BIJ(J+1)=C2*C3
ISN 0056           BIJ(J+2)=C2*S3
ISN 0057           BIJ(J+3)=-S2
ISN 0058           BIJ(J+4)=-C1*S3+S1S2*C3
ISN 0059           BIJ(J+5)=C1*C3+S1S2*S3
ISN 0060           BIJ(J+6)=S1*C2
ISN 0061           BIJ(J+7)=S1*S3+C1S2*C3
ISN 0062           BIJ(J+8)=-S1*C3+C1S2*S3
ISN 0063           BIJ(J+9)=C1*C2
ISN 0064      1100 CONTINUE
ISN 0065           PRINT 2021
ISN 0066      2021 FORMAT(/ 1X,'BEAM UNCOUPLED,UNDAMPED FREQUENCIES (CPS)' /
                 1 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                 2 5X,'(1)',9X,'(2)',9X,'(3)',9X,'(4)',9X,
                 3 '(5)',9X,'(6)')
              C
ISN 0067           DO 1010 IJ = 1,NB
ISN 0068           I = IG(IJ)
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ISN 0069          J = JG(IJ)                                                00000940
ISN 0070          M = MG(IJ)                                                00000950
ISN 0071          N = NG(IJ)                                                00000960
ISN 0072          IF(J.NE.0) GO TO 3300                                     00000970
ISN 0074          J = 81                                                    00000980
ISN 0075          IF(M.NE.0) GO TO 3301                                     00000990
            C                                                               00001000
            C     IF J.EQ.0,WE HAVE A SYMMETRICAL MODEL IN WHICH BEAM IJ    00001010
            C     CONNECTS NODE POINT (I,M) TO AN IMAGINARY POINT (J,N=0)   00001020
            C     LOCATED SYMMETRICALLY ACROSS THE AIRPLANE PLANE OF SYMMETRY  00001030
            C     (X-Z PLANE). FOR THESE TRANSVERSE BEAMS,THE CONDITIONS AT (J,N)  00001040
            C     ARE DEDUCED FROM THE STATE AT (I,M). J IS CHANGED TO 81 BECAUSE  00001050
            C     THE IBM 360-91 WILL NOT ACCEPT A ZERO SUBSCRIPTED VECTOR.  00001060
            C                                                               00001070
            C     IF M.EQ.0,THERE IS NO NODE POINT AT I.                    00001080
            C                                                               00001090
ISN 0077     3302 XMODI = -XDP(I)                                           00001100
ISN 0078          YMODI = -YDP(I)                                           00001110
ISN 0079          ZMODI = -ZDP(I)                                           00001120
ISN 0080          GO TO 3303                                                00001130
            C                                                               00001140
            C     THIS LOOP GETS NODE POINT NUMBER JI KNOWING I AND M.      00001150
            C                                                               00001160
ISN 0081     3301 DO 3305 JI=1,NNP                                          00001170
ISN 0082          IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 3306              00001180
ISN 0084     3305 CONTINUE                                                  00001190
ISN 0085     3306 XMODI = -XNPDP(JI)                                        00001200
ISN 0086          YMODI = -YNPDP(JI)                                        00001210
ISN 0087          ZMODI = -ZNPDP(JI)                                        00001220
ISN 0088     3303 IF(J.NE.81) GO TO 3310                                    00001230
            C                                                               00001240
            C     IF J.EQ.81,WE HAVE A SYMMETRICAL MODEL. NOW CALCULATE     00001250
            C     CONDITIONS AT J,N BASED ON KNOWLEDGE OF STATE AT I,M.     00001260
            C                                                               00001270
ISN 0090          XMODJ =  XMODI                                            00001280
ISN 0091          YMODJ = -YMODI                                            00001290
ISN 0092          ZMODJ =  ZMODI                                            00001300
ISN 0093          GO TO 3320                                                00001310
ISN 0094     3300 IF(M.EQ.0) GO TO 3302                                     00001320
ISN 0096          GO TO 3301                                                00001330
ISN 0097     3310 IF(N.NE.0) GO TO 3311                                     00001340
            C                                                               00001350
            C     IF N.EQ.0,THERE IS NO NODE POINT AT J.                    00001360
            C                                                               00001370
ISN 0099          XMODJ = -XDP(J)                                           00001380
ISN 0100          YMODJ = -YDP(J)                                           00001390
ISN 0101          ZMODJ = -ZDP(J)                                           00001400
ISN 0102          GO TO 3320                                                00001410
            C                                                               00001420
            C     THIS LOOP GETS NODE POINT NUMBER JJ KNOWING J AND N.      00001430
            C                                                               00001440
ISN 0103     3311 DO 3312 JJ=1,NNP                                          00001450
ISN 0104          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 3313              00001460
```

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ISN 0106      3312 CONTINUE                                                00001470
ISN 0107      3313 XMODJ = -XNPDP(JJ)                                      00001480
ISN 0108           YMODJ = -YNPDP(JJ)                                      00001490
ISN 0109           ZMODJ = -ZNPDP(JJ)                                      00001500
              C                                                            00001510
              C    ALL OF THE ABOVE PATHS LEAD TO HERE. WE NOW HAVE POSITIONS  00001520
              C    (XMOD,ETC.) OF BOTH ENDS OF BEAM IJ.                    00001530
              C                                                            00001540
ISN 0110      3320 XIJ = XMODJ-XMODI                                       00001550
ISN 0111           YIJ = YMODJ-YMODI                                       00001560
ISN 0112           ZIJ = ZMODJ-ZMODI                                       00001570
              C                                                            00001580
              C CALCULATE AIJ. FIRST CALCULATE PHIIJ, THEIJ, PSIIJ.        00001590
              C                                                            00001600
ISN 0113           PHIIJ0(IJ) = 0.                                         00001610
ISN 0114           IF(XIJ.EQ.0.AND.YIJ.EQ.0.) GO TO 3330                   00001620
ISN 0116           PSIIJ0(IJ) = ATAN2(YIJ,XIJ)                             00001630
ISN 0117           GO TO 3340                                              00001640
ISN 0118      3330 PSIIJ0(IJ) = 0.                                         00001650
ISN 0119      3340 THEIJ0(IJ) = -ATAN2(ZIJ,SQRT(XIJ*XIJ+YIJ*YIJ))          00001660
              C                                                            00001670
              C  ZERO OUT VERY SMALL SIN AND COS TERMS.                    00001680
              C                                                            00001690
ISN 0120           ARG = PHIIJ0(IJ)                                        00001700
ISN 0121           S1 = SIN(ARG)                                           00001710
ISN 0122           C1 = COS(ARG)                                           00001720
ISN 0123           ARG = THEIJ0(IJ)                                        00001730
ISN 0124           S2 = SIN(ARG)                                           00001740
ISN 0125           C2 = COS(ARG)                                           00001750
ISN 0126           ARG = PSIIJ0(IJ)                                        00001760
ISN 0127           S3 = SIN(ARG)                                           00001770
ISN 0128           C3 = COS(ARG)                                           00001780
ISN 0129           DO 3392 J1 = 1,6                                        00001790
ISN 0130           T = SINCOS(J1)                                          00001800
ISN 0131           IF(T) 3394,3392,3398                                    00001810
ISN 0132      3394 T = -T                                                  00001820
ISN 0133      3398 IF(T-1.E-10) 3396,3392,3392                             00001830
ISN 0134      3396 SINCOS(J1) = 0.0                                        00001840
ISN 0135      3392 CONTINUE                                                00001850
ISN 0136           S1S2 = S1*S2                                            00001860
ISN 0137           C1S2 = C1*S2                                            00001870
ISN 0138           AIJ(1) = C2*C3                                          00001880
ISN 0139           AIJ(2) = C2*S3                                          00001890
ISN 0140           AIJ(3) = -S2                                            00001900
ISN 0141           AIJ(4) = -C1*S3 + S1S2*C3                               00001910
ISN 0142           AIJ(5) = C1*C3 + S1S2*S3                                00001920
ISN 0143           AIJ(6) = S1*C2                                          00001930
ISN 0144           AIJ(7) = S1*S3 + C1S2*C3                                00001940
ISN 0145           AIJ(8) =-S1*C3 + C1S2*S3                                00001950
ISN 0146           AIJ(9) = C1*C2                                          00001960
ISN 0147           J2 = 9*(IJ-1)                                           00001970
ISN 0148           CBIJ = CBAR(IJ)                                         00002000
ISN 0149           IF ((IOLD.NE.0).AND.(I.EQ.IOLD))  GO TO 1120            00002010
```

```
ISN 0151          IS=9*(I-1)
ISN 0152          DO 1110 J2 = 1,9
ISN 0153          IS=IS+1
ISN 0154     1110 AI(J2)=BIJ(IS)
ISN 0155     1120 IOLD=I
ISN 0156          IF(J.NE.81) GO TO 1121
             C
             C    IF J=81,WE HAVE A SYMMETRICAL MODEL AND MUST CALCULATE AJ BASED
             C    ON AI RATHER THAN EULER ANGLES FOR MASS J,WHICH DOESNT EXIST.
             C
ISN 0158          DO 1123 J2=1,9
ISN 0159          AJ(J2) = AI(J2)
ISN 0160     1123 CONTINUE
ISN 0161          AJ(2) = -AJ(2)
ISN 0162          AJ(4) = -AJ(4)
ISN 0163          AJ(6) = -AJ(6)
ISN 0164          AJ(8) = -AJ(8)
ISN 0165          GO TO 1122
ISN 0166     1121 IS=9*(J-1)
ISN 0167          DO 1125 J2 = 1,9
ISN 0168          IS=IS+1
ISN 0169     1125 AJ(J2) = BIJ(IS)
             C
             C  CALCULATE AIJTAJ AND AIJTAI.  FILL TEMP WITH EITHER AJ OR AI.
             C
ISN 0170     1122 DO 6000 I3=1,2
ISN 0171          DO 6010 I4=1,9
ISN 0172          IF(I3.EQ.2) GO TO 6020
ISN 0174          TEMP(I4) = AJ(I4)
ISN 0175          GO TO 6010
ISN 0176     6020 TEMP(I4) = AI(I4)
ISN 0177     6010 CONTINUE
ISN 0178          L2 = 0
ISN 0179          DO 6030 K2=1,3
ISN 0180          DO 6040 J2=1,3
ISN 0181          L2 = L2+1
ISN 0182          SUMM(L2) = 0.
ISN 0183          DO 6050 I2=1,3
ISN 0184          SUMM(L2) = SUMM(L2) + AIJ(3*(J2-1)+I2)*TEMP(3*(K2-1)+I2)
ISN 0185     6050 CONTINUE
ISN 0186          IF(I3.EQ.2) GO TO 6060
ISN 0188          AIJTAJ(L2) = SUMM(L2)
ISN 0189          GO TO 6040
ISN 0190     6060 AIJTAI(L2) = SUMM(L2)
ISN 0191     6040 CONTINUE
ISN 0192     6030 CONTINUE
ISN 0193     6000 CONTINUE
             C
             C COMPUTE BEAM FREQUENCY AND DAMPING CONSTANTS.
             C
ISN 0194          KKS=I
ISN 0195          DO 1312 KS = 1,2
ISN 0196          IF (KS.EQ.2.AND.J.NE.81) KKS=J
```

```
ISN 0198          XTHOLD(1,KS)=XI(KKS)
ISN 0199          XTHOLD(2,KS)=XYI(KKS)
ISN 0200          XTHOLD(3,KS)=XZI(KKS)
ISN 0201          XTHOLD(4,KS)=XYI(KKS)
ISN 0202          XTHOLD(5,KS)=YI(KKS)
ISN 0203          XTHOLD(6,KS)=YZI(KKS)
ISN 0204          XTHOLD(7,KS)=XZI(KKS)
ISN 0205          XTHOLD(8,KS)=YZI(KKS)
ISN 0206     1312 XTHOLD(9,KS)=ZI(KKS)
            C
            C  MASS I AND J INERTIAS ARE IN XYZIJI AND XYZIJJ WHICH ARE
            C  EQUIVALENCED TO XTHOLD.  NOW TRANSFORM BOTH TO BEAM IJ AXES
            C  BY PREMULTIPLYING BY AIJTAI(OR AIJTAJ) AND POSTMULTIPLYING
            C  BY THE TRANSPOSE OF SAME.  XII AND XIJ ARE DIAGONAL ELEMENTS
            C  OF RESULTING INERTIA MATRIX FOR MASS I AND J, IN BEAM AXES.
            C
ISN 0207          ABT1=XYZIJI(1)*AIJTAI(1)+XYZIJI(4)*AIJTAI(4)+XYZIJI(7)*AIJTAI(7)
ISN 0208          ABT2=XYZIJI(2)*AIJTAI(1)+XYZIJI(5)*AIJTAI(4)+XYZIJI(8)*AIJTAI(7)
ISN 0209          ABT3=XYZIJI(3)*AIJTAI(1)+XYZIJI(6)*AIJTAI(4)+XYZIJI(9)*AIJTAI(7)
ISN 0210          ABT4=XYZIJI(1)*AIJTAI(2)+XYZIJI(4)*AIJTAI(5)+XYZIJI(7)*AIJTAI(8)
ISN 0211          ABT5=XYZIJI(2)*AIJTAI(2)+XYZIJI(5)*AIJTAI(5)+XYZIJI(8)*AIJTAI(8)
ISN 0212          ABT6=XYZIJI(3)*AIJTAI(2)+XYZIJI(6)*AIJTAI(5)+XYZIJI(9)*AIJTAI(8)
ISN 0213          ABT7=XYZIJI(1)*AIJTAI(3)+XYZIJI(4)*AIJTAI(6)+XYZIJI(7)*AIJTAI(9)
ISN 0214          ABT8=XYZIJI(2)*AIJTAI(3)+XYZIJI(5)*AIJTAI(6)+XYZIJI(8)*AIJTAI(9)
ISN 0215          ABT9=XYZIJI(3)*AIJTAI(3)+XYZIJI(6)*AIJTAI(6)+XYZIJI(9)*AIJTAI(9)
ISN 0216          XXII(1) = AIJTAI(1)*ABT1+AIJTAI(4)*ABT2+AIJTAI(7)*ABT3
ISN 0217          XXII(2) = AIJTAI(2)*ABT4+AIJTAI(5)*ABT5+AIJTAI(8)*ABT6
ISN 0218          XXII(3) = AIJTAI(3)*ABT7+AIJTAI(6)*ABT8+AIJTAI(9)*ABT9
ISN 0219          ABT1=XYZIJJ(1)*AIJTAJ(1)+XYZIJJ(4)*AIJTAJ(4)+XYZIJJ(7)*AIJTAJ(7)
ISN 0220          ABT2=XYZIJJ(2)*AIJTAJ(1)+XYZIJJ(5)*AIJTAJ(4)+XYZIJJ(8)*AIJTAJ(7)
ISN 0221          ABT3=XYZIJJ(3)*AIJTAJ(1)+XYZIJJ(6)*AIJTAJ(4)+XYZIJJ(9)*AIJTAJ(7)
ISN 0222          ABT4=XYZIJJ(1)*AIJTAJ(2)+XYZIJJ(4)*AIJTAJ(5)+XYZIJJ(7)*AIJTAJ(8)
ISN 0223          ABT5=XYZIJJ(2)*AIJTAJ(2)+XYZIJJ(5)*AIJTAJ(5)+XYZIJJ(8)*AIJTAJ(8)
ISN 0224          ABT6=XYZIJJ(3)*AIJTAJ(2)+XYZIJJ(6)*AIJTAJ(5)+XYZIJJ(9)*AIJTAJ(8)
ISN 0225          ABT7=XYZIJJ(1)*AIJTAJ(3)+XYZIJJ(4)*AIJTAJ(6)+XYZIJJ(7)*AIJTAJ(9)
ISN 0226          ABT8=XYZIJJ(2)*AIJTAJ(3)+XYZIJJ(5)*AIJTAJ(6)+XYZIJJ(8)*AIJTAJ(9)
ISN 0227          ABT9=XYZIJJ(3)*AIJTAJ(3)+XYZIJJ(6)*AIJTAJ(6)+XYZIJJ(9)*AIJTAJ(9)
ISN 0228          XXIJ(1) = AIJTAJ(1)*ABT1+AIJTAJ(4)*ABT2+AIJTAJ(7)*ABT3
ISN 0229          XXIJ(2) = AIJTAJ(2)*ABT4+AIJTAJ(5)*ABT5+AIJTAJ(8)*ABT6
ISN 0230          XXIJ(3) = AIJTAJ(3)*ABT7+AIJTAJ(6)*ABT8+AIJTAJ(9)*ABT9
            C
            C  NOW CALCULATE EQUIVALENT MASS AND FREQUENCY.  FINALLY,
            C  DAMPING CONSTANT = CBIJ/PI/FREQ.  THIS IS USED IN DERIV.
            C
ISN 0231          DO 1032 K=1,3
ISN 0232          IF(J.NE.81) GO TO 1034
ISN 0234          XMAS(K) = WGT(I)/2./386.
ISN 0235          XMAS(K+3) = XXII(K)/2.
ISN 0236          GO TO 1036
ISN 0237     1034 XMAS(K) = WGT(I)*WGT(J)/(WGT(I)+WGT(J))/386.
ISN 0238          XMAS(K+3) = XXII(K)*XXIJ(K)/(XXII(K)+XXIJ(K))
ISN 0239     1036 FREQ(K) = SQRT(XK3(K,K,IJ)/XMAS(K))/2/PI
ISN 0240          IF(FREQ(K).NE.0.) GO TO 1400
```

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ISN 0242          C(K,IJ) = 0.
ISN 0243          GO TO 1410
ISN 0244     1400 C(K,IJ) = CBIJ/PI/FREQ(K)
ISN 0245     1410 FREQ(K+3) = SQRT(XK3(K+3,K+3,IJ)/XMAS(K+3))/2/PI
ISN 0246          IF(FREQ(K+3).NE.0.) GO TO 1420
ISN 0248          C(K+3,IJ) = 0.
ISN 0249          GO TO 1032
ISN 0250     1420 C(K+3,IJ) = CBIJ/PI/FREQ(K+3)
ISN 0251     1032 CONTINUE
ISN 0252          PRINT 1038,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),(FREQ(K),K=1,6)
ISN 0253     1038 FORMAT(1X,5I3,1P6E12.4)
ISN 0254     1010 CONTINUE
ISN 0255          PRINT 1021
ISN 0256     1021 FORMAT(/ 1X,'DAMPING TERMS (LB/IN/SEC,TRANSLATIONS (1)-(3) AND LB-
                 1IN-SEC,ROTATIONS (4)-(6))' / 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                 2 7X,'(1)',12X,
                 3 '(2)',12X,'(3)',12X,'(4)',12X,'(5)',12X,'(6)')
ISN 0257          PRINT 1022,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),
                 1 (C(K,IJ),K=1,6),IJ=1,NB)
ISN 0258     1022 FORMAT(1X,5I3,1P6E15.5)
ISN 0259          PRINT 2053
ISN 0260     2053 FORMAT(/ 1X,'EULER ANGLES, BEAM IJ TO AIRPLANE (RADIANS)')
ISN 0261          PRINT 2301
ISN 0262     2301 FORMAT(2X,'IJ  I  J  M  N',4X,'THEIJ0(IJ)',5X,'PSIIJ0(IJ)')
ISN 0263          PRINT 2300,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),
                 1 THEIJ0(IJ),PSIIJ0(IJ),IJ=1,NB)
ISN 0264     2300 FORMAT (1X,5I3,1P2E15.5)
ISN 0265          RETURN
ISN 0266          END
```

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*        LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.      *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C             DATA SET D2334ECHO  AT LEVEL 002 AS OF 07/20/78
ISN 0002              SUBROUTINE ECHO
              C
ISN 0003              DIMENSION CARD (20)
              C
              C
ISN 0004              N = 0
ISN 0005              WRITE (6, 10)
ISN 0006           10 FORMAT (1H1, 30X, 'ECHO OF THE INPUT DATA IN CARD IMAGE FORMAT', /
                     1 '0', 18X, '1', 9X, '2', 9X, '3', 9X, '4', 9X, '5', 9X, '6', 9X,
                     2 '7',  9X, '8', / 10H CARD NO. ,  8 (10H1234567890 ) / )
              C
ISN 0007           20 N = N + 1
ISN 0008              IF (MOD (N, 51) .EQ. 0 ) WRITE (6, 10)
              C
ISN 0010              READ (5, 30, ERR=40, END=70) CARD
ISN 0011           30 FORMAT (20A4)
              C
ISN 0012              WRITE (6, 50) N, CARD
ISN 0013           50 FORMAT (I8, 2X, 20A4)
              C
ISN 0014              GO TO 20
ISN 0015           40 WRITE (6, 60)
ISN 0016           60 FORMAT ('0   10. I/O ERROR ON READ - WILL REWIND INPUT FILE AND R
                     1ETURN' )
              C
ISN 0017           70 REWIND 5
              C
ISN 0018              RETURN
ISN 0019              END
```

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*              LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                  *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334EULER AT LEVEL 001 AS OF 03/24/76
ISN 0002            SUBROUTINE EULER(A,PHI,THETA,PSI)                           00000010
ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                   00000020
ISN 0004            DIMENSION A(9)                                              00000030
ISN 0005            SIN(X) = DSIN(X)                                            00000040
ISN 0006            COS(X) = DCOS(X)                                            00000050
ISN 0007            S1 = SIN(PHI)                                               00000060
ISN 0008            C1 = COS(PHI)                                               00000070
ISN 0009            S2 = SIN(THETA)                                             00000080
ISN 0010            C2 = COS(THETA)                                             00000090
ISN 0011            S3 = SIN(PSI)                                               00000100
ISN 0012            C3 = COS(PSI)                                               00000110
ISN 0013            A(1) =  C2*C3                                               00000120
ISN 0014            A(2) =  C2*S3                                               00000130
ISN 0015            A(3) = -S2                                                  00000140
ISN 0016            A(4) = -C1*S3+S1*S2*C3                                      00000150
ISN 0017            A(5) =  C1*C3+S1*S2*S3                                      00000160
ISN 0018            A(6) =  S1*C2                                               00000170
ISN 0019            A(7) =  S1*S3+C1*S2*C3                                      00000180
ISN 0020            A(8) = -S1*C3+C1*S2*S3                                      00000190
ISN 0021            A(9) =  C1*C2                                               00000200
ISN 0022            RETURN                                                      00000210
ISN 0023            END                                                         00000220
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*              LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.           *
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     COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                 C          DATA SET D2334FSHEL AT LEVEL 002 AS OF 05/17/78
ISN 0002              SUBROUTINE FSHELL(ARRAY,KEY,N)
                 C
ISN 0003              IMPLICIT REAL*8(A-H,O-Z)
ISN 0004              INTEGER*2 N
                 C
                 C    THIS IS A FORTRAN SUBROUTINE FOR SORTING AN INDEPENDENT ARRAY OF
                 C    SIZE N INTO ASCENDING ORDER(ALGERBRAICALLY LEAST FIRST), AND
                 C    PROVIDING A 'KEY' ARRAY WHICH WILL ALLOW SUBROUTINE SHELLX TO
                 C    RETURN DEPENDENT ARRAYS TO THEIR ORIGINAL CORRESPONDENCE WITH THE
                 C    INDEPENDENT ARRAY.
                 C
ISN 0005              DIMENSION ARRAY(1),KEY(1)
                 C
                 C    ESTABLISH THE INITIAL CONDITION OF THE KEY ARRAY.
                 C
ISN 0006              DO 10 I=1, N
ISN 0007           10 KEY(I) = I
                 C
                 C    ESTABLISH THE INITIAL CONDITION FOR M, M IS THE CURRENT NUMBER
                 C    OF SUBSETS INTO WHICH IARRAY HAS BEEN PARTITIONED.
                 C
ISN 0008              M = N
                 C
                 C    REDUCE M, WHEN THE ALGORITHM PROCEEDS WITH THE REDUCED M, THE
                 C    EFFECT IS A MERGE OF THE OLD SUBSETS INTO ABOUT HALF AS MANY
                 C    NEW.  INTIALLY, IARRAY IS PARTITIONED INTO ABOUT N/2 SUBSETS,
                 C    EACH OF WHICH CONTAINS 2 ELEMENTS, WITH THE EXCEPTION THAT ONE
                 C    SUBSET WILL CONTAIN 3 ELEMENTS IF N IS ODD.  IT IS RECOMMENDED
                 C    THAT A SAMPLE PROBLEM BE WORKED BY HAND TO UNDERSTAND THE
                 C    MECHANISM OF THE PARTITIONING.
                 C
ISN 0009           20 M = M / 2
                 C
                 C    TEST THE REDUCED M.  IF M IS ZERO, THE ENTIRE IARRAY HAS BEEN
                 C    SORTED, AND CONTROL IS RETURNED TO THE CALLING PROGRAM.'
                 C
ISN 0010              IF(M) 30,30,40
ISN 0011           30 RETURN
                 C
                 C    SET K=N-M.  THE ELEMENTS IN IARRAY FROM IARRAY(1) TO IARRAY(K)
```

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              C     WILL BE USED AS 'BASE' ELEMENTS FOR COMPARISIONS.  THAT IS,
              C     IARRAY(I) WILL BE COMPARED WITH IARRAY(I+M).  THUS, ALL
              C     ELEMENTS IN IARRAY WILL ENTER THE COMPARISON SEQUENCE.
              C
ISN 0012         40 K = N - M
ISN 0013            DO 70 J=1, K
              C
              C     SINCE THE INDEX ADDRESSING THE 'BASE' ELEMENT MAY BE MODIFIED
              C     'BACKWARDS' BY THE FOLLOWING CODE, SET I=J AND USE I FOR
              C     THE 'BASE' INDEX.  THIS PRESERVES THE CORRECT VALUE OF J FOR THE
              C     NEXT 'BASE'.
              C
ISN 0014            I = J
              C
              C     II IS CREATED TO REFERENCE THE NEXT HEGHEST ELEMENT IN THE
              C     CURRENT SUBSET, WHICH IS TO BE COMPARED WITH IARRAY(I).
              C
ISN 0015         50 II = I + M
              C
              C     COMPARE ARRAY(I) WITH ARRAY(II)
              C
ISN 0016            IF(ARRAY(I) - ARRAY(II)) 70,70,60
              C
              C
ISN 0017         60 TIMBO = ARRAY(I)
ISN 0018            ARRAY(I) = ARRAY(II)
ISN 0019            ARRAY(II) = TIMBO
ISN 0020            TIMBO = KEY(I)
ISN 0021            KEY(I) = KEY(II)
ISN 0022            KEY(II) = TIMBO
              C
              C
ISN 0023            I = I - M
ISN 0024            IF(I) 70,70,50
              C
              C     THE ELEMENT IS PROPERLY PLACED IN ITS SUBSET.  EXAMINE THE NEXT
              C     'BASE' ELEMENT.
              C
ISN 0025         70 CONTINUE
              C
              C     ALL OF THE M SUBSETS HAVE BEEN SORTED
              C
ISN 0026            GO TO 20
ISN 0027            END
```

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*        LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.              *
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     COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                        SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C           DATA SET D2334GENMO AT LEVEL 011 AS OF 06/25/79
              C           DATA SET D2332MGM   AT LEVEL 001 AS OF 12/08/77
              C           DATA SET D2332NGM   AT LEVEL 001 AS OF 11/02/77
              C           DATA SET D2332QGM   AT LEVEL 001 AS OF 07/26/77
ISN 0002              SUBROUTINE GENMOD
              C
ISN 0003              IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004              REAL*8 KUN
ISN 0005              REAL*8 LBAR,MU,KE
ISN 0006              REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)
ISN 0007              INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)
ISN 0008              INTEGER*4 DIR
ISN 0009              INTEGER*4 TITLE(40),BLANK,STOP
ISN 0010              INTEGER*2 CHUG,INBUFF,INBUF(80)
ISN 0011              INTEGER*2 II(40),KK(40),MM(40),MQ(180),NQ(180),MG(150),NG(150)
ISN 0012              INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)
ISN 0013              INTEGER*2 IG,JG,NPNP(80),NEWNP(50),INP(50),MNP(50)
ISN 0014              INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR
ISN 0015              INTEGER*2 N1,NN,IBS,JBS
ISN 0016              INTEGER*2 IJSAVE(180)
ISN 0017              INTEGER*2 NKMVEC(150)
ISN 0018              INTEGER*2 OLDNLB(180)
ISN 0019              DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)
ISN 0020              DIMENSION G(150),VMAX2(6,150),FMAX2(6,150)
ISN 0021              DIMENSION VMAX3(6,150),FMAX3(6,150)
ISN 0022              DIMENSION XK3(6,6,150)
ISN 0023              DIMENSION IJFRT(14),VMAXT(6),FMAXT(6)
ISN 0024              DIMENSION MASSNO(50),DIR(50),NPTS(50)
ISN 0025              DIMENSION IPHDP(80)
ISN 0026              COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
                     1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
                     2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
                     3 MVP
ISN 0027              COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),
                     1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),
                     2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN
ISN 0028              COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
                     1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0029              COMMON/DOIN/ CBAR(150)
ISN 0030              COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),
                     1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT
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ISN 0031          COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),
                 1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                 2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0032          COMMON/INDEAC/ NACC
ISN 0033          COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),
                 1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,
                 2 XGDOT,YGDOT,ZGDOT
ISN 0034          COMMON/INIDCP/ YDP(80)
ISN 0035          COMMON/INPR/ NDRI,NSP
ISN 0036          COMMON/INCFIC/ BETA
ISN 0037          COMMON/MACFIN/ TMAX,IPRINT
ISN 0038          COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD
ISN 0039          COMMON/NP00I4/ NNP
ISN 0040          COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0041          COMMON/NP01I2/ II,KK,MM
ISN 0042          COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN
ISN 0043          COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
ISN 0044          COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),
                 1  YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),
                 2  ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO
ISN 0045          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                 A CEIKF(40),
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                 C NM,NB,I,J,IG(150),JG(150),
                 D N1(900),NN(40),IJPR(150)
ISN 0046          COMMON/COMMR8/ G
ISN 0047          COMMON/UB/ DB(150),IJUB(150),NUB
ISN 0048          COMMON/STUFF/ NEWI(80),NEWIJ(150),NMOLD,NBOLD
ISN 0049          COMMON/COMMR4/ KR     ,LDP    ,LDP1
ISN 0050          COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,
                 1                NPH    ,NMTL   ,NPTS   ,NVBM   ,IJPRT  ,IPHDP,NFBM
ISN 0051          COMMON/COMMI2/ IQ             ,JQ             ,LQ     ,NPQ    ,INBUF ,
                 1                NKMVEC,IJSAVE
ISN 0052          COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT
ISN 0053          EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0054          EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))
ISN 0055          EQUIVALENCE (VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))
ISN 0056          EQUIVALENCE (MASSNO(1),INDEX(1,1)),(DIR(1),INDEX(1,2))
ISN 0057          DO 1 I=1,NM
ISN 0058          NEWI(I) = 0
ISN 0059        1 CONTINUE
ISN 0060          NMNEW = NM
ISN 0061          NMOLD = NM
ISN 0062          NNPOLD = NNP
```

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                  C                                                      00000940
                  C      CARDS 0100                                      00000950
                  C                                                      00000960
ISN 0063                 DO 10 I=1,NM                                    00000970
ISN 0064                 IF(YDP(I).EQ.0.) GO TO 10                       00000980
ISN 0066                 NMNEW = NMNEW+1                                 00000990
ISN 0067                 NEWI(I) = NMNEW                                 00001000
ISN 0068                 WGT(NMNEW) = WGT(I)                             00001010
ISN 0069                 XDP(NMNEW) = XDP(I)                             00001020
ISN 0070                 YDP(NMNEW) = -YDP(I)                            00001030
ISN 0071                 ZDP(NMNEW) = ZDP(I)                             00001040
ISN 0072                 XI(NMNEW) = XI(I)                               00001050
ISN 0073                 YI(NMNEW) = YI(I)                               00001060
ISN 0074                 ZI(NMNEW) = ZI(I)                               00001070
ISN 0075              10 CONTINUE                                        00001080
ISN 0076                 NM = NMNEW                                      00001090
                  C                                                      00001100
                  C      CARDS 0200                                      00001110
                  C                                                      00001120
ISN 0077                 IF(NNP.EQ.0) GO TO 2000                         00001130
ISN 0079                 DO 2001 I=1,NM                                  00001140
ISN 0080                 NPNP(I) = 0                                     00001150
ISN 0081            2001 CONTINUE                                        00001160
ISN 0082                 DO 2002 JJ=1,NNP                                00001170
ISN 0083                 NEWNP(JJ) = 0                                   00001180
ISN 0084                 I = INP(JJ)                                     00001190
ISN 0085                 NPNP(I) = NPNP(I)+1                             00001200
ISN 0086            2002 CONTINUE                                        00001210
                  C                                                      00001220
                  C      NPNP(I) CONTAINS THE NUMBER OF NODE POINTS ATTACHED TO  00001230
                  C      MASS I, FOR ANY MASSES THAT HAVE NODE POINTS.   00001240
                  C                                                      00001250
ISN 0087                 NNPNEW = NNP                                    00001260
ISN 0088                 DO 2010 JJ=1,NNP                                00001270
ISN 0089                 I = INP(JJ)                                     00001280
ISN 0090                 M = MNP(JJ)                                     00001290
ISN 0091                 IF(NEWI(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 2010 00001300
ISN 0093                 NNPNEW = NNPNEW+1                               00001310
ISN 0094                 NEWNP(JJ) = NNPNEW                              00001320
ISN 0095                 XNPDP(NNPNEW) =  XNPDP(JJ)                      00001330
ISN 0096                 YNPDP(NNPNEW) = -YNPDP(JJ)                      00001340
ISN 0097                 ZNPDP(NNPNEW) =  ZNPDP(JJ)                      00001350
ISN 0098                 IF(NEWI(I).NE.0) GO TO 2020                     00001360
                  C                                                      00001370
                  C      THIS IS CENTERLINE MASS WITH OFF-CENTER NODE POINT.  00001380
                  C                                                      00001390
ISN 0100                 NPNP(I) = NPNP(I)+1                             00001400
ISN 0101                 INP(NNPNEW) = I                                 00001410
ISN 0102                 MNP(NNPNEW) = NPNP(I)                           00001420
ISN 0103                 GO TO 2010                                      00001430
                  C                                                      00001440
                  C      THIS IS OFF-CENTER MASS.                        00001450
                  C                                                      00001460
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ISN 0104      2020 INP(NNPNEW) = NEWI(I)
ISN 0105           MNP(NNPNEW) = M
ISN 0106      2010 CONTINUE
ISN 0107           NNP = NNPNEW
             C
             C     CARDS 0300
             C
ISN 0108      2000 IF(NSP.EQ.0) GO TO 41
ISN 0110           NSPNEW = NSP
ISN 0111           DO 30 J=1,NSP
ISN 0112           I = II(J)
ISN 0113           K = KK(J)
ISN 0114           M = MM(J)
ISN 0115           IF(M.EQ.0) GO TO 2003
ISN 0117           DO 2004 JJ=1,NNP
ISN 0118           IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2005
ISN 0120      2004 CONTINUE
ISN 0121      2005 IF(NEWI(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 30
ISN 0123           GO TO 2006
ISN 0124      2003 IF(NEWI(I).EQ.0) GO TO 30
ISN 0126      2006 NSPNEW = NSPNEW+1
ISN 0127           II(NSPNEW) = NEWI(I)
ISN 0128           KK(NSPNEW) = K
ISN 0129           MM(NSPNEW) = M
ISN 0130           IF(M.EQ.0) GO TO 2007
ISN 0132           IF(NEWI(I).NE.0) GO TO 2007
ISN 0134           II(NSPNEW) = I
ISN 0135           MM(NSPNEW) = MNP(NEWNP(JJ))
ISN 0136      2007 XLBAR(NSPNEW) = XLBAR(J)
ISN 0137           IF(K.EQ.2) XLBAR(NSPNEW) = -XLBAR(NSPNEW)
ISN 0139           XMU(NSPNEW) = XMU(J)
ISN 0140           XKE(NSPNEW) = XKE(J)
ISN 0141           XMAX(NSPNEW) = XMAX(J)
ISN 0142           GFLEX(NSPNEW) = GFLEX(J)
             C
             C     CARDS 0400
             C
ISN 0143           SI(NSPNEW) = SI(J)
ISN 0144           SA(NSPNEW) = SA(J)
ISN 0145           SB(NSPNEW) = SB(J)
ISN 0146           SF(NSPNEW) = SF(J)
ISN 0147           FSPOI(NSPNEW) = FSPOI(J)
ISN 0148           FSPOF(NSPNEW) = FSPOF(J)
ISN 0149           CDAMP(NSPNEW)=CDAMP(J)
ISN 0150           FSPOP(NSPNEW)=FSPOP(J)
ISN 0151           SCP(NSPNEW)  =SCP(J)
ISN 0152           STEMP1(NSPNEW)=STEMP1(J)
ISN 0153           STEMP2(NSPNEW)=STEMP2(J)
ISN 0154           STEMP3(NSPNEW)=STEMP3(J)
ISN 0155           STEMP4(NSPNEW)=STEMP4(J)
ISN 0156           STEMP5(NSPNEW)=STEMP5(J)
ISN 0157        30 CONTINUE
ISN 0158           NSP = NSPNEW
```

```
ISN 0159        41 CONTINUE                                           00002000
             C                                                        00002010
             C     CARDS 0500                                         00002020
             C                                                        00002030
ISN 0160           IF(NB.EQ.0) GO TO 101                              00002040
ISN 0162           DO 99 I=1,NB                                       00002050
ISN 0163           NEWIJ(I) = 0                                       00002060
ISN 0164        99 CONTINUE                                           00002070
ISN 0165           NBNEW = NB                                         00002080
ISN 0166           NBOLD = NB                                         00002090
ISN 0167           DO 50 K=1,NB                                       00002100
ISN 0168           I = IG(K)                                          00002110
ISN 0169           J = JG(K)                                          00002120
ISN 0170           M = MG(K)                                          00002130
ISN 0171           N = NG(K)                                          00002140
ISN 0172           IF(M .EQ. 0) GO TO 70                              00002150
ISN 0174           DO 71 JJ=1, NNPOLD                                 00002160
ISN 0175           IF(I .NE. INP(JJ) .OR. M .NE. MNP(JJ)) GO TO 71    00002170
ISN 0177           IF(YNPDP(JJ) .EQ. 0.0) GO TO 72                    00002180
ISN 0179           GO TO 51                                           00002190
ISN 0180        71 CONTINUE                                           00002200
ISN 0181           PRINT 2030                                         00002210
ISN 0182      2030 FORMAT(5X, '3. DATA ERROR IN GENMOD AT 2030')      00002220
ISN 0183           STOP                                               00002230
ISN 0184        70 IF(YDP(I) .NE. 0.0) GO TO 51                       00002240
ISN 0186        72 IF(N .EQ. 0) GO TO 73                              00002250
ISN 0188           DO 74 JJ=1, NNPOLD                                 00002260
ISN 0189           IF(J .NE. INP(JJ) .OR. N .NE. MNP(JJ)) GO TO 74    00002270
ISN 0191           IF(YNPDP(JJ) .EQ. 0.0) GO TO 50                    00002280
ISN 0193           GO TO 90                                           00002290
ISN 0194        74 CONTINUE                                           00002300
ISN 0195           PRINT 2040                                         00002310
ISN 0196      2040 FORMAT(5X, '4. DATA ERROR IN GENMOC AT 2040')      00002320
ISN 0197           STOP                                               00002330
ISN 0198        73 IF(YDP(J) .EQ. 0.0) GO TO 50                       00002340
ISN 0200           GO TO 90                                           00002350
ISN 0201        51 IF(J .NE. 0) GO TO 90                              00002360
ISN 0203           JG(K) = NEWI(I)                                    00002370
ISN 0204           NG(K) = M                                          00002380
ISN 0205           GO TO 50                                           00002390
             C                                                        00002400
             C     FOR ALL OTHER SITUATIONS, WE MUST ADD NEW BEAMS TO MODEL.  00002410
             C                                                        00002420
ISN 0206        90 NBNEW = NBNEW+1                                    00002430
ISN 0207           NEWIJ(K) = NBNEW                                   00002440
ISN 0208           IF(YDP(I).EQ.0.OR.YDP(J).EQ.0.) GO TO 52           00002450
             C                                                        00002460
             C     BOTH I AND J MASSES OFF AIRPLANE X-Z PLANE.        00002470
             C                                                        00002480
ISN 0210           IG(NBNEW) = NEWI(I)                                00002490
ISN 0211           JG(NBNEW) = NEWI(J)                                00002500
ISN 0212           MG(NBNEW) = M                                      00002510
ISN 0213           NG(NBNEW) = N                                      00002520
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ISN 0214          GO TO 80                                                     00002530
ISN 0215       52 ITEST = 0                                                    00002540
ISN 0216          IF(YDP(I).EQ.0.) GO TO 53                                    00002550
            C                                                                  00002560
            C     MASS I IS OFF X-Z PLANE, J IS ON.                            00002570
            C     GET NODE POINT NUMBER JN FOR MASS J.                         00002580
            C                                                                  00002590
ISN 0218          IF(N.NE.0) GO TO 55                                          00002600
ISN 0220          MG(NBNEW) = 0                                                00002610
ISN 0221          GO TO 57                                                     00002620
ISN 0222       55 DO 54 JN=1,NNP                                               00002630
ISN 0223          IF(INP(JN).EQ.J.AND.MNP(JN).EQ.N) GO TO 56                   00002640
ISN 0225       54 CONTINUE                                                     00002650
ISN 0226       56 MG(NBNEW) = N                                                00002660
ISN 0227          IF(NEWNP(JN).EQ.0) GO TO 57                                  00002670
ISN 0229          MG(NBNEW) = MNP(NEWNP(JN))                                   00002680
ISN 0230       57 NG(NBNEW) = M                                                00002690
ISN 0231          IG(NBNEW) = J                                                00002700
ISN 0232          JG(NBNEW) = NEWI(I)                                          00002710
ISN 0233          GO TO 80                                                     00002720
ISN 0234       53 IF(YDP(J).EQ.0.) GO TO 59                                    00002730
            C                                                                  00002740
            C     MASS I IS ON X-Z PLANE, J IS OFF.                            00002750
            C     GET NODE POINT NUMBER JM FOR MASS I.                         00002760
            C                                                                  00002770
ISN 0236       60 IF(M.NE.0) GO TO 61                                          00002780
ISN 0238          MG(NBNEW) = 0                                                00002790
ISN 0239          GO TO 62                                                     00002800
ISN 0240       61 DO 63 JM=1,NNP                                               00002810
ISN 0241          IF(INP(JM).EQ.I.AND.MNP(JM).EQ.M) GO TO 64                   00002820
ISN 0243       63 CONTINUE                                                     00002830
ISN 0244       64 MG(NBNEW) = M                                                00002840
ISN 0245          IF(NEWNP(JM).EQ.0) GO TO 62                                  00002850
ISN 0247          MG(NBNEW) = MNP(NEWNP(JM))                                   00002860
ISN 0248       62 IF(ITEST.NE.0) GO TO 58                                      00002870
ISN 0250          NG(NBNEW) = N                                                00002880
ISN 0251          IG(NBNEW) = I                                                00002890
ISN 0252          JG(NBNEW) = NEWI(J)                                          00002900
ISN 0253          GO TO 80                                                     00002910
            C                                                                  00002920
            C     BOTH MASSES I AND J ARE ON X-Z PLANE.                        00002930
            C                                                                  00002940
ISN 0254       59 ITEST = 1                                                    00002950
ISN 0255          IG(NBNEW) = I                                                00002960
ISN 0256          JG(NBNEW) = J                                                00002970
ISN 0257          GO TO 60                                                     00002980
ISN 0258       58 IF(N.NE.0) GO TO 150                                         00002990
ISN 0260          NG(NBNEW) = 0                                                00003000
ISN 0261          GO TO 80                                                     00003010
ISN 0262      150 DO 151 JN=1,NNP                                              00003020
ISN 0263          IF(INP(JN).EQ.J.AND.MNP(JN).EQ.N) GO TO 152                  00003030
ISN 0265      151 CONTINUE                                                     00003040
ISN 0266      152 NG(NBNEW) = N                                                00003050
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ISN 0267          IF(NEWNP(JN).EQ.0) GO TO 80                              00003060
ISN 0269          NG(NBNEW) = MNP(NEWNP(JN))                               00003070
            C                                                              00003080
            C     ALL ABOVE STUFF GETS I,J,M AND N FOR NEW BEAM.           00003090
            C     NOW SET ITS PARAMETERS EQUAL TO THOSE FOR ITS TWIN.      00003100
            C                                                              00003110
ISN 0270       80 MC(NBNEW) = MC(K)                                        00003120
ISN 0271          AA(NBNEW) = AA(K)                                        00003130
ISN 0272          YY(NBNEW) = YY(K)                                        00003140
ISN 0273          ZZ(NBNEW) = ZZ(K)                                        00003150
ISN 0274          XJ(NBNEW) = XJ(K)                                        00003160
ISN 0275          Z1(NBNEW) = Z1(K)                                        00003170
ISN 0276          Z2(NBNEW) = Z2(K)                                        00003180
ISN 0277          XIQ(NBNEW)=XIQ(K)                                        00003190
ISN 0278          PY(NBNEW) = PY(K)                                        00003200
ISN 0279          PYJ(NBNEW)=PYJ(K)                                        00003210
ISN 0280          PZ(NBNEW) = PZ(K)                                        00003220
ISN 0281          PZJ(NBNEW)=PZJ(K)                                        00003230
ISN 0282          SF26(NBNEW)=SF26(K)                                      00003240
ISN 0283          SF35(NBNEW)=SF35(K)                                      00003250
ISN 0284          SF26J(NBNEW)=SF26J(K)                                    00003260
ISN 0285          SF35J(NBNEW)=SF35J(K)                                    00003270
ISN 0286          CBAR(NBNEW) = CBAR(K)                                    00003280
ISN 0287          IJPR(NBNEW) = 0                                          00003290
ISN 0288          IJUB(NBNEW)=IJUB(K)                                      00003300
ISN 0289          DB(NBNEW)=DB(K)                                          00003310
ISN 0290       50 CONTINUE                                                 00003320
ISN 0291          NB = NBNEW                                               00003330
ISN 0292      101 CONTINUE                                                 00003340
            C                                                              00003350
            C     CARDS 0601 AND UP                                        00003360
            C                                                              00003370
ISN 0293          IF(ND.EQ.0) GO TO 102                                    00003380
ISN 0295          CDUM = .01                                               00003390
ISN 0296          IF(DAMPC.NE.0.) CDUM = DAMPC                             00003400
ISN 0298          ND = 0                                                   00003410
ISN 0299          DO 103 IJ=1,NB                                           00003420
ISN 0300          IF(CBAR(IJ).EQ.CDUM) GO TO 103                           00003430
ISN 0302          ND = ND+1                                                00003440
ISN 0303      103 CONTINUE                                                 00003450
ISN 0304      102 CONTINUE                                                 00003460
ISN 0305          IF(NOLEO.EQ.0.) GO TO 709                                00003470
ISN 0307          NOLEON=NOLEO                                             00003480
ISN 0308          DO 701 J=1,NOLEO                                         00003490
ISN 0309          DO 702 IJ=1,NBOLD                                        00003500
ISN 0310          IF(IGOLEO(J).EQ. IG(IJ).AND.JGOLEO(J).EQ. JG(IJ).AND.MGOLEO(J) 00003510
                 1.EQ.MG(IJ).AND. NGOLEO(J).EQ.NG(IJ)) GO TO 703           00003520
ISN 0312      702 CONTINUE                                                 00003530
ISN 0313      703 IF(NEWIJ(IJ).EQ.0) GO TO 701                             00003540
ISN 0315          JI=NEWIJ(IJ)                                             .0003550
ISN 0316          NOLEON=NOLEON+1                                          00003560
ISN 0317          IGOLEO(NOLEON)=IG(JI)                                    00003570
ISN 0318          JGOLEO(NOLEON)=JG(JI)                                    00003580
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ISN 0319          MGOLEO(NOLEON)=MG(JI)                                       00003590
ISN 0320          NGOLEO(NOLEON)=NG(JI)                                       00003600
ISN 0321          EOLEO(NOLEON)=EOLEO(J)                                      00003610
ISN 0322          FAO(NOLEON)=FAO(J)                                          00003620
ISN 0323          FAA(NOLEON)=FAA(J)                                          00003630
ISN 0324          EXPOLE(NOLEON)=EXPOLE(J)                                    00003640
ISN 0325          YMAX(NOLEON)=YMAX(J)                                        00003650
ISN 0326          BOLEO(NOLEON)=BOLEO(J)                                      00003660
ISN 0327          BROLEO(NOLEON)=BROLEO(J)                                    00003670
ISN 0328          XKEXT(NOLEON)=XKEXT(J)                                      00003680
ISN 0329          XKCOMP(NOLEON)=XKCOMP(J)                                    00003690
ISN 0330          FCOUL(NOLEON)=FCOUL(J)                                      00003700
ISN 0331      701 CONTINUE                                                    00003710
ISN 0332          NOLEO=NOLEON                                                00003720
ISN 0333      709 CONTINUE                                                    00003730
            C                                                                 00003740
            C     CARDS 0700                                                  00003750
            C                                                                 00003760
ISN 0334          IF(NLB.EQ.0) GO TO 250                                      00003770
            C                                                                 00003780
            C     SEARCH NONLINEAR BEAM SPECIFICATION TABLE (CARDS 0701 TO 0700+NLB)00003790
            C     TO DETERMINE WHICH NEW ELEMENTS ARE TO BE ADDED.            00003800
            C                                                                 00003810
ISN 0336          DO 240 K=1,180                                              00003820
ISN 0337          OLDNLB(K) = 0                                               00003830
ISN 0338      240 CONTINUE                                                    00003840
ISN 0339          NLBOLD = NLB                                                00003850
ISN 0340          NLBNEW = NLB                                                00003860
ISN 0341          DO 200 K=1,NLBOLD                                           00003870
ISN 0342          I = IQ(K)                                                   00003880
ISN 0343          J = JQ(K)                                                   00003890
ISN 0344          M = MQ(K)                                                   00003900
ISN 0345          N = NQ(K)                                                   00003910
            C                                                                 00003920
            C     IF J.EQ.0 IN OLD TABLE,CHANGE IT TO NEWI(I) FOR BIG MODEL   00003930
            C     TO AGREE WITH NEW BEAM NUMBERING.                           00003940
            C                                                                 00003950
ISN 0346          IF(J.EQ.0) J = NEWI(I)                                      00003960
ISN 0348          DO 210 IJ=1,NBOLD                                           00003970
ISN 0349          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00003980
                1 GO TO 220                                                   00003990
ISN 0351      210 CONTINUE                                                    00004000
ISN 0352      220 IF(NEWIJ(IJ).EQ.0) GO TO 200                                00004010
            C                                                                 00004020
            C     IF THERE IS A NEW BEAM CORRESPONDING TO THE OLD ONE,INCREMENT  00004030
            C     THE NLBNEW COUNTER AND SET THE NEW TABLE PARAMETERS EQUAL TO   00004040
            C     THE OLD VALUES EXCEPTING THE IJ IDENTIFICATION,OTHERWISE BYPASS. 00004050
            C                                                                 00004060
ISN 0354          NLBNEW = NLBNEW+1                                           00004070
ISN 0355          IQ(NLBNEW) = IG(NEWIJ(IJ))                                  00004080
ISN 0356          JQ(NLBNEW) = JG(NEWIJ(IJ))                                  00004090
ISN 0357          MQ(NLBNEW) = MG(NEWIJ(IJ))                                  00004100
ISN 0358          NQ(NLBNEW) = NG(NEWIJ(IJ))                                  00004110
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ISN 0359          LQ(NLBNEW) = LQ(K)                                                00004120
ISN 0360          NPQ(NLBNEW) = NPQ(K)                                              00004130
ISN 0361          LDP(NLBNEW) = LDP(K)                                              00004140
ISN 0362          LDP1(NLBNEW) = LDP1(K)                                            00004150
            C                                                                       00004160
            C     NOW CALCULATE IJSAVE AND NLSFLG FOR THE NEW BEAM(S) AND SET       00004170
            C     UP VECTORS SHOWING CORRESPONDENCE BETWEEN OLD AND NEW NONLINEAR   00004180
            C     BEAM TABLE NUMBERS.                                               00004190
            C                                                                       00004200
ISN 0363          IJSAVE(NLBNEW) = NEWIJ(IJ)                                        00004210
ISN 0364          NLSFLG(6*(NEWIJ(IJ)-1)+LQ(K)) = NLBNEW                            00004220
ISN 0365          OLDNLB(NLBNEW) = K                                                00004230
ISN 0366      200 CONTINUE                                                          00004240
ISN 0367          NLB = NLBNEW                                                      00004250
            C                                                                       00004260
            C     CARDS 0800                                                        00004270
            C                                                                       00004280
            C                                                                       00004290
            C     NOW WE MUST SEARCH ALL THE NEW KR TABLE SPECS TO SEE IF ANY       00004300
            C     REQUIRE DIRECT INPUT ON CARDS 0801-08XX FOR NP.GT.9.IF SO,        00004310
            C     WE MUST FILL THE KR AND XKR TABLES FROM NLBOLD WHICH WAS DONE     00004320
            C     IN INPUT TO THE NEW VALUE NLBNEW.                                 00004330
            C                                                                       00004340
ISN 0368          NLBOP1 = NLBOLD+1                                                 00004350
ISN 0369          DO 230 I=NLBOP1,NLBNEW                                            00004360
ISN 0370          NP = NPQ(I)                                                       00004370
ISN 0371          IF(NP.LT.10) GO TO 230                                            00004380
ISN 0373          ICH = (I-1)*15                                                    00004390
ISN 0374          OLDICH = (OLDNLB(I)-1)*15                                         00004400
ISN 0375          DO 241 J=1,NP                                                     00004410
ISN 0376          XKR(ICH+J) = XKR(OLDICH+J)                                        00004420
ISN 0377          KR(ICH+J) = KR(OLDICH+J)                                          00004430
ISN 0378      241 CONTINUE                                                          00004440
ISN 0379      230 CONTINUE                                                          00004450
ISN 0380      250 CONTINUE                                                          00004460
            C                                                                       00004470
            C     CARDS 1000                                                        00004480
            C                                                                       00004490
            C     DELETED OLD INPUT SELECTED STRESS BEAMS 1000 CARDS                00004500
            C                                                                       00004510
            C     CARDS 1101 AND UP                                                 00004520
            C                                                                       00004530
ISN 0381          IF(NDRI.EQ.0) GO TO 340                                           00004540
ISN 0383          NDRINW = NDRI                                                     00004550
ISN 0384          DO 330 IJ=1,NBOLD                                                 00004560
ISN 0385            IF(IJPR(IJ).NE.1.OR.NEWIJ(IJ).EQ.0) GO TO 330                   00004570
ISN 0387          NDRINW = NDRINW+1                                                 00004580
ISN 0388          IJPR(NEWIJ(IJ)) = 1                                               00004590
ISN 0389          IJPRT(2*NDRINW-1) = IG(NEWIJ(IJ))                                 00004600
ISN 0390          IJPRT(2*NDRINW) = JG(NEWIJ(IJ))                                   00004610
ISN 0391          IJPRT(2*NDRINW-1) = IG(NEWIJ(IJ))                                 00004620
ISN 0392          IJPRT(2*NDRINW) = JG(NEWIJ(IJ))                                   00004630
ISN 0393      330 CONTINUE                                                          00004640
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ISN 0394          NDRI = NDRINW                                                    00004650
ISN 0395      340 CONTINUE                                                         00004660
            C                                                                      00004670
            C     CARDS 1200                                                       00004680
            C                                                                      00004690
ISN 0396          IF(NVCH.EQ.0) GO TO 360                                          00004700
            C                                                                      00004710
            C     SET EVEN NUMBERED CORNER MASS NUMBERS EQUAL TO NEW MASSES        00004720
            C     ACROSS FROM ODD NUMBERED CORNER MASSES.                          00004730
            C                                                                      00004740
ISN 0398          DO 380 I=1,NVCH                                                  00004750
ISN 0399          DO 370 K=2,8,2                                                   00004760
ISN 0400          INBUFF(I,K) = NEWI(INBUFF(I,K-1))                                00004770
ISN 0401      370 CONTINUE                                                         00004780
ISN 0402      380 CONTINUE                                                         00004790
ISN 0403      360 CONTINUE                                                         00004800
            C                                                                      00004810
            C     CARDS 1300                                                       00004820
            C                                                                      00004830
ISN 0404          IF(NVBM.EQ.0) GO TO 450                                          00004840
ISN 0406          NVBMNW = NVBM                                                    00004850
ISN 0407          DO 410 JI=1,NVBM                                                 00004860
ISN 0408          IF(JG(IJVM(JI)).EQ.0) JG(IJVM(JI)) = NEWI(IG(IJVM(JI)))          00004870
ISN 0410          I = IG(IJVM(JI))                                                 00004880
ISN 0411          J = JG(IJVM(JI))                                                 00004890
ISN 0412          M = MG(IJVM(JI))                                                 00004900
ISN 0413          N = NG(IJVM(JI))                                                 00004910
ISN 0414          DO 420 IJ=1,NBOLD                                                00004920
ISN 0415          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00004930
                 1 GO TO 430                                                       00004940
ISN 0417      420 CONTINUE                                                         00004950
ISN 0418      430 IF(NEWIJ(IJ).EQ.0) GO TO 410                                     00004960
ISN 0420          NVBMNW = NVBMNW+1                                                00004970
ISN 0421          IJVM(NVBMNW) = NEWIJ(IJ)                                         00004980
ISN 0422          DO 440 L=1,6                                                     00004990
ISN 0423          VMAX2(L,NEWIJ(IJ)) = VMAX2(L,IJ)                                 00005000
ISN 0424      440 CONTINUE                                                         00005010
ISN 0425      410 CONTINUE                                                         00005020
ISN 0426          NVBM = NVBMNW                                                    00005030
ISN 0427      450 CONTINUE                                                         00005040
ISN 0428          IF(NVBMN.EQ.0) GO TO 460                                         00005050
ISN 0430          NVBMNW=NVBMN                                                     00005060
ISN 0431          DO 461 JI=1,NVBMN                                                00005070
ISN 0432          IF(JG(IJVMN(JI)).EQ.0) JG(IJVMN(JI))=NEWI(IG(IJVMN(JI)))         00005080
ISN 0434          I=IG(IJVMN(JI))                                                  00005090
ISN 0435          J=JG(IJVMN(JI))                                                  00005100
ISN 0436          M=MG(IJVMN(JI))                                                  00005110
ISN 0437          N=NG(IJVMN(JI))                                                  00005120
ISN 0438          DO 462  IJ=1,NBOLD                                               00005130
ISN 0439          IF (I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) 00005140
                 1 GO TO 463                                                       00005150
ISN 0441      462 CONTINUE                                                         00005160
ISN 0442      463 IF(NEWIJ(IJ).EQ.0) GO TO 461                                     00005170
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ISN 0444          NVBMNW=NVBMNW+1                                              00005180
ISN 0445          IJVMN(NVBMNW)=NEWIJ(IJ)                                      00005190
ISN 0446          DO 465 L=1,6                                                 00005200
ISN 0447          VMAX3(L,NEWIJ(IJ))=VMAX3(L,IJ)                               00005210
ISN 0448      465 CONTINUE                                                     00005220
ISN 0449      461 CONTINUE                                                     00005230
ISN 0450          NVBMN=NVBMNW                                                 00005240
ISN 0451      460 CONTINUE                                                     00005250
ISN 0452          IF(NFBM.EQ.0) GO TO 400                                      00005260
ISN 0454          NFBMNW=NFBM                                                  00005270
ISN 0455          DO 451 JI=1,NFBM                                             00005280
ISN 0456          IF(JG(IJFM(JI)).EQ.0) JG(IJFM(JI)) = NEWI(IG(IJFM(JI)))      00005290
ISN 0458          I = IG(IJFM(JI))                                             00005300
ISN 0459          J = JG(IJFM(JI))                                             00005310
ISN 0460          M = MG(IJFM(JI))                                             00005320
ISN 0461          N = NG(IJFM(JI))                                             00005330
ISN 0462          DO 452 IJ=1,NBOLD                                            00005340
ISN 0463          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).              00005350
                 1AND.N.EQ.NG(IJ)) GO TO 453                                   00005360
ISN 0465      452 CONTINUE                                                     00005370
ISN 0466      453 IF(NEWIJ(IJ).EQ.0) GO TO 451                                 00005380
ISN 0468          NFBMNW=NFBMNW+1                                              00005390
ISN 0469          IJFM(NFBMNW) = NEWIJ(IJ)                                     00005400
ISN 0470          DO 455 L=1,6                                                 00005410
ISN 0471          FMAX2(L,NEWIJ(IJ))=FMAX2(L,IJ)                               00005420
ISN 0472      455 CONTINUE                                                     00005430
ISN 0473      451 CONTINUE                                                     00005440
ISN 0474          NFBM=NFBMNW                                                  00005450
ISN 0475      400 CONTINUE                                                     00005460
ISN 0476          IF(NFBMN.EQ.0) GO TO 470                                     00005470
ISN 0478          NFBMNW=NFBMN                                                 00005480
ISN 0479          DO 471 JI=1,NFBMN                                            00005490
ISN 0480          IF(JG(IJFMN(JI)).EQ.0) JG(IJFMN(JI))=NEWI(IG(IJFMN(JI)))     00005500
ISN 0482          I=IG(IJFMN(JI))                                              00005510
ISN 0483          J=JG(IJFMN(JI))                                              00005520
ISN 0484          M=MG(IJFMN(JI))                                              00005530
ISN 0485          N=NG(IJFMN(JI))                                              00005540
ISN 0486          DO 472 IJ=1,NBOLD                                            00005550
ISN 0487          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00005560
                 1 GO TO 473                                                   00005570
ISN 0489      472 CONTINUE                                                     00005580
ISN 0490      473 IF(NEWIJ(IJ).EQ.0) GO TO 471                                 00005590
ISN 0492          NFBMNW=NFBMNW+1                                              00005600
ISN 0493          IJFMN(NFBMNW)=NEWIJ(IJ)                                      00005610
ISN 0494          DO 475 L=1,6                                                 00005620
ISN 0495          FMAX3(L,NEWIJ(IJ))=FMAX3(L,IJ)                               00005630
ISN 0496      475 CONTINUE                                                     00005640
ISN 0497      471 CONTINUE                                                     00005650
ISN 0498          NFBMN=NFBMNW                                                 00005660
ISN 0499      470 CONTINUE                                                     00005670
            C                                                                  00005680
ISN 0500          LL=0                                                         00005690
ISN 0501          L=KOUNT                                                      00005700
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ISN 0502          IF(NACC.EQ.0) GO TO 490                                00005710
ISN 0504          NACNEW=NACC                                            00005720
ISN 0505          DO 476 K=1,NACC                                        00005730
ISN 0506          I=MASSNO(K)                                            00005740
ISN 0507          IF(NEWI(I).EQ.0) GO TO 491                             00005750
ISN 0509          NACNEW=NACNEW+1                                        00005760
ISN 0510          IN=NEWI(I)                                             00005770
ISN 0511          MASSNO(NACNEW)=IN                                      00005780
ISN 0512          DIR(NACNEW)=DIR(K)                                     00005790
ISN 0513          NPTS(NACNEW)=NPTS(K)                                   00005800
ISN 0514          JAY(NACNEW,1)=NACNEW                                   00005810
ISN 0515          JJ=NPTS(K)                                             00005820
ISN 0516          DO 477 JK=1,JJ                                         00005830
ISN 0517          L=L+1                                                  00005840
ISN 0518          LL=LL+1                                                00005850
ISN 0519          TIM(L)=TIM(LL)                                         00005860
ISN 0520          ACCEL(L)=ACCEL(LL)                                     00005870
ISN 0521      477 CONTINUE                                               00005880
ISN 0522          KOUNT=KOUNT+NPTS(K)                                    00005890
ISN 0523          IF(KOUNT.GT.300) GO TO 478                             00005900
ISN 0525      491 CONTINUE                                               00005910
ISN 0526          NACC=NACNEW                                            00005920
ISN 0527      476 CONTINUE                                               00005930
ISN 0528          GO TO 490                                              00005940
ISN 0529      478 PRINT 479,NACC,KOUNT                                   00005950
ISN 0530      479 FORMAT(1X,'7.ERROR IN ACCEL TIME DATA INPUT'/1X,'NUMACL,KOUNT=',  00005960
                 1 2I5)                                                  00005970
ISN 0531      490 CONTINUE                                               00005980
            C     CARDS 1400                                             00005990
            C                                                            00006000
ISN 0532          IF(NHI.EQ.0) GO TO 500                                 00006010
ISN 0534          NHINEW = NHI                                           00006020
ISN 0535          DO 510 K=1,NHI                                         00006030
ISN 0536          I = INBUF(K)                                           00006040
ISN 0537          IF(NEWI(I).EQ.0) GO TO 510                             00006050
ISN 0539          NHINEW = NHINEW+1                                      00006060
ISN 0540          IN = NEWI(I)                                           00006070
ISN 0541          INBUF(NHINEW) = IN                                     00006080
ISN 0542          ALIFT(IN) = ALIFT(I)                                   00006090
ISN 0543          HEX(IN) = HEX(I)                                       00006100
ISN 0544          HEY(IN) = HEY(I)                                       00006110
ISN 0545          HEZ(IN) = HEZ(I)                                       00006120
ISN 0546          XYI(IN) = XYI(I)                                       00006130
ISN 0547          YZI(IN) = YZI(I)                                       00006140
ISN 0548          XZI(IN) = XZI(I)                                       00006150
ISN 0549      510 CONTINUE                                               00006160
ISN 0550          NHI = NHINEW                                           00006170
ISN 0551      500 CONTINUE                                               00006180
            C                                                            00006190
            C     CARDS 1500                                             00006200
            C                                                            00006210
ISN 0552          IF(NPH.EQ.0) GO TO 530                                 00006220
ISN 0554          NPHNEW = NPH                                           00006230
```

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ISN 0555          DO 540 J=1,NPH                                                 00006240
ISN 0556          I = IPHDP(J)                                                   00006250
ISN 0557          IF(NEWI(I).EQ.0) GO TO 540                                     00006260
ISN 0559          NPHNEW = NPHNEW+1                                              00006270
ISN 0560          IN = NEWI(I)                                                   00006280
ISN 0561          PHIDP(IN) = -PHIDP(I)                                          00006290
ISN 0562          THEDP(IN) =  THEDP(I)                                          00006300
ISN 0563          PSIDP(IN) = -PSIDP(I)                                          00006310
ISN 0564          IPHDP(NPHNEW) = IN                                             00006320
ISN 0565      540 CONTINUE                                                       00006330
ISN 0566          NPH = NPHNEW                                                   00006340
            C                                                                    00006350
            C     CARDS 1600                                                     00006360
            C                                                                    00006370
ISN 0567          DO 570 IJ=1,NBOLD                                              00006380
ISN 0568          IF(NEWIJ(IJ).EQ.0) GO TO 570                                   00006390
ISN 0570          IJN = NEWIJ(IJ)                                                00006400
ISN 0571          PHIIJ(IJN) = -PHIIJ(IJ)                                        00006410
ISN 0572          THEIJ(IJN) =  THEIJ(IJ)                                        00006420
ISN 0573          PSIIJ(IJN) = -PSIIJ(IJ)                                        00006430
ISN 0574      570 CONTINUE                                                       00006440
ISN 0575      530 CONTINUE                                                       00006450
            C                                                                    00006460
            C     CARDS 2100                                                     00006470
            C                                                                    00006480
ISN 0576          IF(NKM.EQ.0) GO TO 600                                         00006490
ISN 0578          NKMNEW = NKM                                                   00006500
ISN 0579          DO 610 IJ=1,NBOLD                                              00006510
ISN 0580          IF(NKMVEC(IJ).EQ.0.OR.NEWIJ(IJ).EQ.0) GO TO 610                00006520
ISN 0582          NKMNEW = NKMNEW+1                                              00006530
ISN 0583          IJN = NEWIJ(IJ)                                                00006540
ISN 0584          NKMVEC(IJN) = 1                                                00006550
ISN 0585          DO 620 K=1,6                                                   00006560
ISN 0586          DO 620 L=1,6                                                   00006570
ISN 0587          XK3(L,K,IJN) = XK3(L,K,IJ)                                     00006580
ISN 0588      620 CONTINUE                                                       00006590
ISN 0589      610 CONTINUE                                                       00006600
ISN 0590          NKM = NKMNEW                                                   00006610
ISN 0591      600 CONTINUE                                                       00006620
ISN 0592          IF(PUNMOD.EQ.0) GO TO 700                                      00006630
ISN 0594          IPUNCH = 7                                                     00006640
            C                                                                    00006650
            C     CARD 0001,0002                                                 00006660
            C                                                                    00006670
ISN 0595          WRITE(IPUNCH,1000) TITLE                                       00006680
            C                                                                    00006690
            C     CARD 0003                                                      00006700
            C                                                                    00006710
ISN 0596          WRITE(IPUNCH,1010) NM,NSP,NB,NLB,NS,MVP,NVCH,NDRI,NPL,NACC,NVBM, 00006720
                 1 NHI,NPH,ND                                                    00006730
            C                                                                    00006740
            C     CARD 0004                                                      00006750
            C                                                                    00006760
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ISN 0597          WRITE(IPUNCH,1020) IPRINT,DELTAT,TMAX,PLOWT,RUNMOD,NKM            00006770
             C                                                                       00006780
             C    CARD 0005                                                          00006790
             C                                                                       00006800
ISN 0598          LINE = 005                                                         00006810
ISN 0599          WRITE(IPUNCH,1030) XGDOT,YGDOT,ZGDOT,LINE                          00006820
             C                                                                       00006830
             C    CARD 0006                                                          00006840
             C                                                                       00006850
ISN 0600          LINE = 006                                                         00006860
ISN 0601          WRITE(IPUNCH,1030) PPR,QPR,RPR,LINE                                00006870
             C                                                                       00006880
             C    CARD 0007                                                          00006890
             C                                                                       00006900
ISN 0602          LINE = 007                                                         00006910
ISN 0603          WRITE(IPUNCH,1040) PHIPR,THEPR,PSIPR,XGIN,ZGIN,BETA,LINE           00006920
             C                                                                       00006930
             C    CARDS 0100                                                         00006940
             C                                                                       00006950
ISN 0604          LINE = 101                                                         00006960
ISN 0605          DO 900 I=1,NM                                                      00006970
ISN 0606          WRITE(IPUNCH,1050) WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),  00006980
                 1 LINE                                                              00006990
ISN 0607          LINE = LINE+1                                                      00007000
ISN 0608      900 CONTINUE                                                           00007010
             C                                                                       00007020
             C    CARDS 0200                                                         00007030
             C                                                                       00007040
ISN 0609          IF(NNP.EQ.0) GO TO 904                                             00007050
ISN 0611          LINE = 201                                                         00007060
ISN 0612          WRITE(IPUNCH,1055) (MNP(I),INP(I),XNPDP(I),YNPDP(I),ZNPDP(I),      00007070
                 1 I=1,NNP),LINE                                                     00007080
             C                                                                       00007090
             C    CARDS 0300                                                         00007100
             C                                                                       00007110
ISN 0613      904 LINE = 301                                                         00007120
ISN 0614          DO 905 J=1,NSP                                                     00007130
ISN 0615          WRITE(IPUNCH,1060) MM(J),II(J),KK(J),XLBAR(J),XMU(J),XKE(J),       00007140
                 1 XMAX(J),LINE                                                      00007150
ISN 0616          LINE = LINE+1                                                      00007160
ISN 0617      905 CONTINUE                                                           00007170
             C                                                                       00007180
             C    CARDS 0400                                                         00007190
             C                                                                       00007200
ISN 0618          LINE = 401                                                         00007210
ISN 0619          DO 910 J=1,NSP                                                     00007220
ISN 0620          WRITE(IPUNCH,1040) SI(J),SA(J),SB(J),SF(J),FSPOI(J),FSPOF(J),      00007230
                 1 LINE                                                              00007240
ISN 0621          LINE = LINE+1                                                      00007250
ISN 0622      910 CONTINUE                                                           00007260
             C                                                                       00007270
             C    CARDS 0500                                                         00007280
             C                                                                       00007290
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ISN 0623          LINE = 501                                                    00007300
ISN 0624          DO 915 I=1,NB                                                 00007310
ISN 0625          WRITE(IPUNCH,1070) MG(I),IG(I),NG(I),JG(I),E(I),AA(I),G(I),   00007320
                 1 YY(I),ZZ(I),PY(I),PZ(I),LINE                                 00007330
ISN 0626          LINE = LINE+1                                                 00007340
ISN 0627      915 CONTINUE                                                      00007350
            C                                                                   00007360
            C     CARD 0600                                                     00007370
            C                                                                   00007380
ISN 0628          WRITE(IPUNCH,1080) DAMPC                                      00007390
            C                                                                   00007400
            C     CARDS 0601 AND UP                                             00007410
            C                                                                   00007420
ISN 0629          LINE = 601                                                    00007430
ISN 0630          DO 920 IJ=1,NB                                                00007440
ISN 0631          WRITE(IPUNCH,1090) MG(IJ),IG(IJ),NG(IJ),JG(IJ),CBAR(IJ),LINE  00007450
ISN 0632          LINE = LINE+1                                                 00007460
ISN 0633      920 CONTINUE                                                      00007470
            C                                                                   00007480
            C     CARDS 0700                                                    00007490
            C                                                                   00007500
            C                                                                   00007510
            C     CARDS 0800                                                    00007520
            C                                                                   00007530
            C                                                                   00007540
            C     CARDS 1000                                                    00007550
            C                                                                   00007560
            C                                                                   00007570
            C     CARD 1100                                                     00007580
            C                                                                   00007590
            C                                                                   00007600
            C     CARDS 1101 AND UP                                             00007610
            C                                                                   00007620
            C                                                                   00007630
            C     CARDS 1200                                                    00007640
            C                                                                   00007650
            C                                                                   00007660
            C     CARDS 1300                                                    00007670
            C                                                                   00007680
            C                                                                   00007690
            C     CARDS 1400                                                    00007700
            C                                                                   00007710
            C                                                                   00007720
            C     CARDS 1500                                                    00007730
            C                                                                   00007740
            C                                                                   00007750
            C     CARDS 1600                                                    00007760
            C                                                                   00007770
            C                                                                   00007780
            C     CARDS 1700,1800                                               00007790
            C                                                                   00007800
            C                                                                   00007810
            C     CARDS 2000                                                    00007820
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                C                                                    00007830
                C                                                    00007840
                C     CARDS 2100                                     00007850
                C                                                    00007860
ISN 0634       1000 FORMAT(20A4)                                     00007870
ISN 0635       1010 FORMAT(14I5,7X,'003')                            00007880
ISN 0636       1020 FORMAT(I10,1P3E10.3,20X,F5.1,I5,7X,'004')        00007890
ISN 0637       1030 FORMAT(1P3E10.3,46X,I4)                          00007900
ISN 0638       1040 FORMAT(1P6E10.3,16X,I4)                          00007910
ISN 0639       1050 FORMAT(1P7E10.3,6X,I4)                           00007920
ISN 0640       1055 FORMAT(2I5,1P3E10.3,36X,I4)                      00007930
ISN 0641       1060 FORMAT(3I5,1P4E10.3,21X,I4)                      00007940
ISN 0642       1070 FORMAT(2(I2,I3),1P5E10.3,2I5,6X,I4)              00007950
ISN 0643       1080 FORMAT(1PE10.3,67X,'600')                        00007960
ISN 0644       1090 FORMAT(4I5,1PE10.3,46X,I4)                       00007970
ISN 0645        700 RETURN                                           00007980
ISN 0646            END                                              00007990
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*                                                                                    *
*           LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.             *
*                                                                                    *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334IC     AT LEVEL 003 AS OF 06/25/79
              C          DATA SET D2332NIC    AT LEVEL 007 AS OF 12/01/77              00000010
              C          DATA SET D2332NIC    AT LEVEL 005 AS OF 11/04/77              00000020
              C          DATA SET D2332MIC    AT LEVEL 002 AS OF 09/02/77              00000030
ISN 0002            SUBROUTINE IC                                                      00000040
              C                                                                        00000050
ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                          00000060
ISN 0004            REAL*8 KUN                                                         00000070
ISN 0005            REAL*4 CLTEST                                                      00000080
ISN 0006            INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                        00000090
ISN 0007            INTEGER*4 TITLE(40)                                                00000100
ISN 0008            INTEGER*2 N1,NN                                                    00000110
ISN 0009            INTEGER*2 INBUFF                                                   00000120
ISN 0010            INTEGER*2 IJPR,IG,JG                                               00000130
ISN 0011            INTEGER*2 II(40),KK(40),MM(40),MG(150),NG(150),INP(50),MNP(50)     00000140
ISN 0012            DIMENSION XMPR(3),ABARPR(3,3),ANGDPR(3),DPR(3,3),AIDP(3,3),        00000150
                   1 AIC(3,3),ADPR(3,3),VJP(80,3),APR(3,3),VIP(3),XV(3)                00000160
ISN 0013            DIMENSION XK3(6,6,150),YZMIN(150)                                  00000170
ISN 0014            DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)       00000180
ISN 0015            DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)       00000190
ISN 0016            DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)00000200
ISN 0017            DIMENSION IMDRI(80)                                                00000210
ISN 0018            COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),            00000220
                   1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),     00000230
                   2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                      00000240
ISN 0019            COMMON/CFIC/ SINBET,COSBET,ABETA(9)                                00000250
ISN 0020            COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),        00000260
                   1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)           00000270
ISN 0021            COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                  00000280
                   1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,                00000290
                   2 XGDOT,YGDOT,ZGDOT                                                 00000300
ISN 0022            COMMON/INIDCP/ YDP(80)                                             00000310
ISN 0023            COMMON/INCFIC/ BETA                                                00000320
ISN 0024            COMMON/INPR/ NDRI,NSP                                              00000330
ISN 0025            COMMON/MCFIII/ SYMFLG                                              00000340
ISN 0026            COMMON/NP00I2/ MG,NG,INP,MNP                                       00000350
ISN 0027            COMMON/NP01I2/ II,KK,MM                                            00000360
ISN 0028            COMMON/NP00I4/ NNP                                                 00000370
ISN 0029            COMMON/NP00R8/ RX,RY,RZ                                            00000380
ISN 0030            COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,             00000390
                   1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                         00000400
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ISN 0031          COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                        00000410
ISN 0032          COMMON/OLEO/ EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),             00000420
                 1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),         00000430
                 2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO              00000440
ISN 0033          COMMON/DEIC/ WTOT,CLTEST(150)                                           00000450
ISN 0034          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000460
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),                  00000470
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),                 00000480
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),          00000490
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),        00000500
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,        00000510
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                                   00000520
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,                   00000530
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),                 00000540
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),               00000550
                 A CEIKF(40),                                                             00000560
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                                  00000570
                 C NM,NB,I,J,IG(150),JG(150),                                             00000580
                 D N1(900),NN(40),IJFR(150)                                               00000590
ISN 0035          COMMON/IPIC/ NIC                                                        00000600
ISN 0036          EQUIVALENCE (PPR,XMPR(1)),(QPR,XMPR(2)),(RPR,XMPR(3)),                  00000610
                 1  (PHIDPR,ANGDPR(1)),(THEDPR,ANGDPR(2)),(PSIDPR,ANGDPR(3))              00000620
ISN 0037          EQUIVALENCE (XK(1),XK3(1,1,1))                                          00000630
ISN 0038          SIN(X) = DSIN(X)                                                        00000640
ISN 0039          COS(X) = DCOS(X)                                                        00000650
ISN 0040          SQRT(X) = DSQRT(X)                                                      00000660
ISN 0041          ARSIN(X) = DARSIN(X)                                                    00000670
ISN 0042          ATAN2(Y,X) = DATAN2(Y,X)                                                00000680
ISN 0043          AMIN1(X,Y) = DMIN1(X,Y)                                                 00000690
ISN 0044          ABS(X)=DABS(X)                                                          00000700
ISN 0045          WTOT = 0.0                                                              00000710
ISN 0046          PI = 3.14159265358979324D0                                              00000720
ISN 0047          PI2 = PI/2.                                                             00000730
ISN 0048          PIN = -PI                                                               00000740
ISN 0049          PI2N = -PI2                                                             00000750
ISN 0050          BETAR = BETA*PI/180.                                                    00000760
ISN 0051          SINBET = DSIN(BETAR)                                                    00000770
ISN 0052          COSBET = DCOS(BETAR)                                                    00000780
ISN 0053          ABETA(1) = COSBET                                                       00000790
ISN 0054          ABETA(2) = 0.                                                           00000800
ISN 0055          ABETA(3) =-SINBET                                                       00000810
ISN 0056          ABETA(4) = 0.                                                           00000820
ISN 0057          ABETA(5) = 1.                                                           00000830
ISN 0058          ABETA(6) = 0.                                                           00000840
ISN 0059          ABETA(7) = SINBET                                                       00000850
ISN 0060          ABETA(8) = 0.                                                           00000860
ISN 0061          ABETA(9) = COSBET                                                       00000870
ISN 0062          KMATR(1,1) = 3                                                          00000880
ISN 0063          KMATR(1,2) = 4                                                          00000890
ISN 0064          KMATR(1,3) = 7                                                          00000900
ISN 0065          KMATR(1,4) = 8                                                          00000910
ISN 0066          KMATR(2,1) = 1                                                          00000920
ISN 0067          KMATR(2,2) = 2                                                          00000930
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ISN 0068          KMATR(2,3) = 5                                          00000940
ISN 0069          KMATR(2,4) = 6                                          00000950
ISN 0070          KMATR(3,1) = 1                                          00000960
ISN 0071          KMATR(3,2) = 3                                          00000970
ISN 0072          KMATR(3,3) = 5                                          00000980
ISN 0073          KMATR(3,4) = 7                                          00000990
ISN 0074          KMATR(4,1) = 2                                          00001000
ISN 0075          KMATR(4,2) = 4                                          00001010
ISN 0076          KMATR(4,3) = 6                                          00001020
ISN 0077          KMATR(4,4) = 8                                          00001030
ISN 0078          KMATR(5,1) = 1                                          00001040
ISN 0079          KMATR(5,2) = 2                                          00001050
ISN 0080          KMATR(5,3) = 3                                          00001060
ISN 0081          KMATR(5,4) = 4                                          00001070
ISN 0082          KMATR(6,1) = 5                                          00001080
ISN 0083          KMATR(6,2) = 6                                          00001090
ISN 0084          KMATR(6,3) = 7                                          00001100
ISN 0085          KMATR(6,4) = 8                                          00001110
ISN 0086          IF(BETA.EQ.90.D0) GO TO 2000                            00001120
ISN 0088          TANBET = SINBET/COSBET                                  00001130
ISN 0089     2000 ZSLMAX = 0.0                                            00001140
ISN 0090          DO 2002 I=1,6                                           00001150
ISN 0091          DO 2002 K=1,150                                         00001160
ISN 0092          FINT(I,K) = 0.D0                                        00001170
ISN 0093     2002 CONTINUE                                                00001180
ISN 0094          PRINT 2001                                              00001190
ISN 0095     2001 FORMAT(1H1 / 1X,'MODEL PARAMETERS')                     00001200
ISN 0096          DO 2006 I=1,NM                                          00001210
ISN 0097          IMDRI(I) = 0                                            00001220
ISN 0098     2006 CONTINUE                                                00001230
ISN 0099          DO 2004 IJ=1,NB                                         00001240
ISN 0100          IF(IJPR(IJ).NE.0) IMDRI(JG(IJ))=1                       00001250
ISN 0102     2004 CONTINUE                                                00001260
ISN 0103          DO 2010 I = 1,NM                                        00001270
ISN 0104          IF(IMDRI(I).NE.0) GO TO 2010                            00001280
ISN 0106          WTOT = WTOT+WGT(I)                                      00001290
             C                                                            00001300
             C    FOR SYMMETRICAL MODEL,ADD CONTRIBUTIONS FROM OTHER SIDE. 00001310
             C                                                            00001320
ISN 0107          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2010              00001330
ISN 0109          WTOT = WTOT+WGT(I)                                      00001340
ISN 0110     2010 CONTINUE                                                00001350
ISN 0111          PRINT 2011,WTOT                                         00001360
ISN 0112     2011 FORMAT(/ 1X,'VEHICLE WT = ',1PE12.6)                    00001370
ISN 0113          XGDP = 0.0                                              00001380
ISN 0114          YGDP = 0.0                                              00001390
ISN 0115          ZGDP = 0.0                                              00001400
ISN 0116          DO 2020 I = 1,NM                                        00001410
ISN 0117          IF(IMDRI(I).NE.0) GO TO 2020                            00001420
ISN 0119          XGDP = XGDP+WGT(I)*XDP(I)                               00001430
ISN 0120          YGDP = YGDP+WGT(I)*YDP(I)                               00001440
ISN 0121          ZGDP = ZGDP+WGT(I)*ZDP(I)                               00001450
ISN 0122          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020              00001460
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```
ISN 0124          XGDP = XGDP+WGT(I)*XDP(I)
ISN 0125          YGDP = YGDP-WGT(I)*YDP(I)
ISN 0126          ZGDP = ZGDP+WGT(I)*ZDP(I)
ISN 0127     2020 CONTINUE
ISN 0128          XGDP = XGDP/WTOT
ISN 0129          YGDP = YGDP/WTOT
ISN 0130          ZGDP = ZGDP/WTOT
ISN 0131          PRINT 2013
ISN 0132     2013 FORMAT(/ 1X,'VEHICLE CG POSITION')
ISN 0133          PRINT 2012,XGDP,YGDP,ZGDP
ISN 0134     2012 FORMAT(1X,'X (FS) = ',1PE12.5 /
                1        1X,'Y (BL) = ',1PE12.5 /
                1        1X,'Z (WL) = ',1PE12.5)
               C APRIME AND ABARPRIME (3)
ISN 0135          CALL EULER(APR,PHIPR,THEPR,PSIPR)
ISN 0136          S1 = SIN(PHIPR)
ISN 0137          C1 = COS(PHIPR)
ISN 0138          S2 = SIN(THEPR)
ISN 0139          C2 = COS(THEPR)
               C NOW ABARPRIME (4)
ISN 0140          ABARPR(1,1) = 1.0
ISN 0141          ABARPR(2,1) = 0.0
ISN 0142          ABARPR(3,1) = 0.0
ISN 0143          ABARPR(1,2) = S1*S2/C2
ISN 0144          ABARPR(2,2) = C1
ISN 0145          ABARPR(3,2) = S1/C2
ISN 0146          ABARPR(1,3) = C1*S2/C2
ISN 0147          ABARPR(2,3) = -S1
ISN 0148          ABARPR(3,3) = C1/C2
               C ANGLE DOT PRIMES (6)
ISN 0149          CALL MATVEC(ABARPR,XMPR,ANGDPR,0)
               C D PRIME (7)
ISN 0150          DPR(1,1) = 0.0
ISN 0151          DPR(1,2) = THEDPR*S1-PSIDPR*C1*C2
ISN 0152          DPR(1,3) = THEDPR*C1+PSIDPR*S1*C2
ISN 0153          DPR(2,1) = -DPR(1,2)
ISN 0154          DPR(2,2) = 0.0
ISN 0155          DPR(2,3) = -PHIDPR+PSIDPR*S2
ISN 0156          DPR(3,1) = -DPR(1,3)
ISN 0157          DPR(3,2) = -DPR(2,3)
ISN 0158          DPR(3,3) = 0.0
               C A DOT PRIME (8)
ISN 0159          CALL MATMUL(APR,DPR,ADPR)
ISN 0160          ZCMAX = 0.0
ISN 0161          ZSLMAX = 0.
ISN 0162          DO 2040 I = 1,NM
ISN 0163          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0164          CALL MATMUL(APR,AIDP,AIC)
ISN 0165          THETA(I) = -ARSIN(AIC(3,1))
ISN 0166          IF(THEPR.GT.PI2.AND.THEPR.LE.PI) THETA(I)=PI-THETA(I)
ISN 0168          IF(THEPR.LT.PI2N.AND.THEPR.GE.PIN) THETA(I)=PIN+THETA(I)
ISN 0170          CT = 1./COS(THETA(I))
ISN 0171          PHI(I) = ARSIN(AIC(3,2)*CT)
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ISN 0172          PSI(I) = ARSIN(AIC(2,1)*CT)
ISN 0173          VJP(I,1) = XGDP-XDP(I)
ISN 0174          VJP(I,2) = YGDP-YDP(I)
ISN 0175          VJP(I,3) = ZGDP-ZDP(I)
ISN 0176     2040 CONTINUE
            C
            C     CALCULATE VECTOR COMPONENTS FROM MASS I TO NODE POINT M
            C     FOR ALL NNP NODE POINTS.
            C
ISN 0177          IF(NNP.EQ.0) GO TO 2051
ISN 0179          DO 3000 JJ=1,NNP
ISN 0180          I = INP(JJ)
ISN 0181          T1 = XDP(I)-XNPDP(JJ)
ISN 0182          T2 = YDP(I)-YNPDP(JJ)
ISN 0183          T3 = ZDP(I)-ZNPDP(JJ)
            C
            C  THESE ARE IN (-) AIRPLANE AXES.  CONVERT TO BODY AXES BY
            C  MULTIPLYING BY AIDP TRANSPOSE.  THIS NORMALLY IS UNITY.
            C
ISN 0184          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0185          RX(JJ) = AIDP(1,1)*T1 + AIDP(2,1)*T2 + AIDP(3,1)*T3
ISN 0186          RY(JJ) = AIDP(1,2)*T1 + AIDP(2,2)*T2 + AIDP(3,2)*T3
ISN 0187          RZ(JJ) = AIDP(1,3)*T1 + AIDP(2,3)*T2 + AIDP(3,3)*T3
ISN 0188     3000 CONTINUE
            C
            C     DETERMINE LOWEST SPRING.
            C
ISN 0189     2051 DO 2050 IKM=1,NSP
ISN 0190          I = II(IKM)
ISN 0191          K = KK(IKM)
ISN 0192          M = MM(IKM)
ISN 0193          IF(M.NE.0) GO TO 2052
ISN 0195          RRX = 0.
ISN 0196          RRY = 0.
ISN 0197          RRZ = 0.
ISN 0198          GO TO 2054
ISN 0199     2052 DO 2056 JJ=1,NNP
ISN 0200          IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2058
ISN 0202     2056 CONTINUE
ISN 0203     2058 RRX = RX(JJ)
ISN 0204          RRY = RY(JJ)
ISN 0205          RRZ = RZ(JJ)
ISN 0206     2054 CONTINUE
            C
            C     EQUATIONS (1-122) FOR AI.
            C
ISN 0207          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0208          CALL MATMUL(APR,AIDP,AIC)
ISN 0209          DVR1 = AIC(1,1)*RRX+AIC(1,2)*RRY+AIC(1,3)*RRZ
ISN 0210          DVR3 = AIC(3,1)*RRX+AIC(3,2)*RRY+AIC(3,3)*RRZ
ISN 0211          VC = AIC(3,K)*XLBAR(IKM)+DVR3
ISN 0212          VCX = AIC(1,K)*XLBAR(IKM)+DVR1
ISN 0213          DO 2062 L=1,3
```

```
ISN 0214          VC = VC+APR(3,L)*VJP(I,L)                                    00002530
ISN 0215          VCX = VCX+APR(1,L)*VJP(I,L)                                  00002540
ISN 0216     2062 CONTINUE                                                     00002550
ISN 0217          ZSL = VCX*SINBET+VC*COSBET                                   00002560
ISN 0218          IF(VC-ZCMAX) 2064,2064,2066                                  00002570
ISN 0219     2066 ZCMAX = VC                                                   00002580
ISN 0220     2064 IF(ZSL-ZSLMAX) 2050,2050,2068                                00002590
ISN 0221     2068 ZSLMAX = ZSL                                                 00002600
ISN 0222     2050 CONTINUE                                                     00002610
ISN 0223          PRINT 2014                                                   00002620
ISN 0224     2014 FORMAT(/ 1X,'VEHICLE INERTIAS (IN-LB-SEC**2)')               00002630
ISN 0225          XIG = 0                                                      00002640
ISN 0226          YIG = 0                                                      00002650
ISN 0227          ZIG = 0                                                      00002660
ISN 0228          DO 2015 I=1,NM                                               00002670
ISN 0229          IF(IMDRI(I).NE.0) GO TO 2015                                 00002680
ISN 0231          XARM = XDP(I) - XGDP                                         00002690
ISN 0232          YARM = YDP(I) - YGDP                                         00002700
ISN 0233          ZARM = ZDP(I) - ZGDP                                         00002710
ISN 0234          GOODY1 = WGT(I)*(YARM*YARM+ZARM*ZARM)/386.                   00002720
ISN 0235          GOODY2 = WGT(I)*(XARM*XARM+ZARM*ZARM)/386.                   00002730
ISN 0236          GOODY3 = WGT(I)*(XARM*XARM+YARM*YARM)/386.                   00002740
ISN 0237          XIG = XIG+XI(I)+GOODY1                                       00002750
ISN 0238          YIG = YIG+YI(I)+GOODY2                                       00002760
ISN 0239          ZIG = ZIG+ZI(I)+GOODY3                                       00002770
ISN 0240          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2015                   00002780
ISN 0242          XIG = XIG+XI(I)+GOODY1                                       00002790
ISN 0243          YIG = YIG+YI(I)+GOODY2                                       00002800
ISN 0244          ZIG = ZIG+ZI(I)+GOODY3                                       00002810
ISN 0245     2015 CONTINUE                                                     00002820
ISN 0246          PRINT 2016,XIG,YIG,ZIG                                       00002830
ISN 0247     2016 FORMAT(1X,'I(XX) = ',1PE11.5 / 1X,'I(YY) = ',1PE11.5 / 1X,   00002840
                 1'I(ZZ) = ',1PE11.5)                                          00002850
ISN 0248          ZSL = -ZSLMAX-.001                                           00002860
ISN 0249          ZG = -ZCMAX-.001                                             00002870
ISN 0250          IF(BETA) 2101,2101,2102                                      00002880
ISN 0251     2101 XG = 0.                                                      00002890
ISN 0252          GO TO 2220                                                   00002900
ISN 0253     2102 IF(BETA-90.)  2103,2104,2103                                 00002910
ISN 0254     2104 XG = ZSL                                                     00002920
ISN 0255          GO TO 2220                                                   00002930
ISN 0256     2103 ZSLG = -ZSL/COSBET                                           00002940
ISN 0257          DELZ = -ZG-ZSLG+ZGIN                                         00002950
ISN 0258          XG = DELZ/TANBET                                             00002960
ISN 0259     2220 PRINT 2105                                                   00002970
ISN 0260     2105 FORMAT(/ 1X,'VEHICLE CG INITIAL GROUND COORDINATES' /        00002980
                 1 1X,'XCG IS THE DISTANCE FROM SLOPE/GROUND INTERSECTION TO VEHICLE00002990
                 2 CG,+FORWARD' /                                              00003000
                 3 1X,'ZCG IS THE DISTANCE FROM GROUND PLANE TO VEHICLE CG,+DOWN') 00003010
ISN 0261          DELXG = XG-XGIN                                              00003020
ISN 0262          DELZG = ZG-ZGIN                                              00003030
ISN 0263          PRINT 2091,DELXG,DELZG                                       00003040
ISN 0264     2091 FORMAT(1X,'XCG = ',1PE12.5 / 1X,'ZCG = ',1PE12.5)            00003050
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ISN 0265          DO 2022 IJ=1,NB                                          00003060
ISN 0266          I = IG(IJ)                                               00003070
ISN 0267          J = JG(IJ)                                               00003080
ISN 0268          M = MG(IJ)                                               00003090
ISN 0269          N = NG(IJ)                                               00003100
ISN 0270          IF(M.EQ.0) GO TO 5020                                    00003110
ISN 0272          DO 5010 JI=1,NNP                                         00003120
ISN 0273          IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 5020             00003130
ISN 0275     5010 CONTINUE                                                 00003140
ISN 0276     5020 IF(N.EQ.0) GO TO 5030                                    00003150
ISN 0278          DO 5040 JJ=1,NNP                                         00003160
ISN 0279          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5030             00003170
ISN 0281     5040 CONTINUE                                                 00003180
            C                                                              00003190
            C     THE FOLLOWING CODE GETS CLTEST(IJ),WHICH IS 1 IF BEAM IJ 00003200
            C     LIES ENTIRELY IN THE CENTER PLANE OF THE AIRPLANE.THIS   00003210
            C     IS USED IN DERIV FOR A NUMBER OF TESTS.                  00003220
            C                                                              00003230
ISN 0282     5030 CLTEST(IJ) = 0.                                          00003240
ISN 0283          IF(SYMFLG.NE.1.) GO TO 2022                              00003250
ISN 0285          IF(YDP(I).NE.0.OR.YDP(J).NE.0.) GO TO 2022               00003260
            C                                                              00003270
            C  BOTH MASSES ON CENTERLINE.                                   00003280
            C                                                              00003290
ISN 0287          IF(M.EQ.0.AND.N.EQ.0) GO TO 5000                         00003300
ISN 0289          IF(M.EQ.0) GO TO 5001                                    00003310
ISN 0291          IF(N.EQ.0) GO TO 5002                                    00003320
ISN 0293          IF(YNPDP(JI).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 5000        00003330
ISN 0295          GO TO 2022                                               00003340
ISN 0296     5001 IF(YNPDP(JJ).EQ.0.) GO TO 5000                           00003350
ISN 0298          GO TO 2022                                               00003360
ISN 0299     5002 IF(YNPDP(JI).EQ.0.) GO TO 5000                           00003370
ISN 0301          GO TO 2022                                               C0003380
ISN 0302     5000 CLTEST(IJ) = 1.                                          00003390
ISN 0303     2022 CONTINUE                                                 00003400
            C                                                              00003410
            C LOOPC                                                        00003420
            C                                                              00003430
ISN 0304     2150 DO 2090 I = 1,NM                                         00003440
ISN 0305          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))              00003450
ISN 0306          CALL MATMUL(APR,AIDP,AIC)                                00003460
ISN 0307          VIP(1) = VJP(I,1)                                        00003470
ISN 0308          VIP(2) = VJP(I,2)                                        00003480
ISN 0309          VIP(3) = VJP(I,3)                                        00003490
            C (14)                                                         00003500
ISN 0310          CALL MATVEC(APR,VIP,XV,0)                                00003510
ISN 0311          XV(1) = XV(1)+XG-XGIN                                    00003520
ISN 0312          XV(3) = XV(3)+ZG-ZGIN                                    00003530
ISN 0313          X(I) = XV(1)                                             00003540
ISN 0314          Y(I) = XV(2)                                             00003550
ISN 0315          Z(I) = XV(3)                                             00003560
            C (15)                                                         00003570
ISN 0316          CALL MATVEC(ADPR,VIP,XV,0)                               00003580
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ISN 0317         XV(1) = XV(1)+XGDOT                                      00003590
ISN 0318         XV(2) = XV(2)+YGDOT                                      00003600
ISN 0319         XV(3) = XV(3)+ZGDOT                                      00003610
ISN 0320         XDOT(I) = XV(1)                                          00003620
ISN 0321         YDOT(I) = XV(2)                                          00003630
ISN 0322         ZDOT(I) = XV(3)                                          00003640
           C (16)                                                         00003650
ISN 0323         CALL MATVEC(AIC,XV,VIP,1)                                00003660
ISN 0324         U(I) = VIP(1)                                            00003670
ISN 0325         V(I) = VIP(2)                                            00003680
ISN 0326         W(I) = VIP(3)                                            00003690
           C (17)                                                         00003700
ISN 0327         CALL MATVEC(AIDP,XMPR,VIP,1)                             00003710
ISN 0328         P(I) = VIP(1)                                            00003720
ISN 0329         Q(I) = VIP(2)                                            00003730
ISN 0330         R(I) = VIP(3)                                            00003740
           C AIBAR (18)                                                   00003750
ISN 0331         S1 = SIN(PHI(I))                                         00003760
ISN 0332         C1 = COS(PHI(I))                                         00003770
ISN 0333         S2 = SIN(THETA(I))                                       00003780
ISN 0334         C2 = COS(THETA(I))                                       00003790
ISN 0335         ABARPR(1,2) = S1*S2/C2                                   00003800
ISN 0336         ABARPR(2,2) = C1                                         00003810
ISN 0337         ABARPR(3,2) = S1/C2                                      00003820
ISN 0338         ABARPR(1,3) = C1*S2/C2                                   00003830
ISN 0339         ABARPR(2,3) = -S1                                        00003840
ISN 0340         ABARPR(3,3) = C1/C2                                      00003850
           C (19)                                                         00003860
ISN 0341         CALL MATVEC(ABARPR,VIP,XV,0)                             00003870
ISN 0342         PHIDOT(I) = XV(1)                                        00003880
ISN 0343         THEDOT(I) = XV(2)                                        00003890
ISN 0344         PSIDOT(I) = XV(3)                                        00003900
           C END LOOP C                                                   00003910
ISN 0345    2090 CONTINUE                                                 00003920
ISN 0346         IF(NNP.EQ.0) GO TO 4000                                  00003930
ISN 0348         DO 4010 JJ=1,NNP                                         00003940
ISN 0349         I = INP(JJ)                                              00003950
ISN 0350         CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))              00003960
ISN 0351         CALL MATMUL(APR,AIDP,AIC)                                00003970
ISN 0352         TX = AIC(1,1)*RX(JJ)+AIC(1,2)*RY(JJ)+AIC(1,3)*RZ(JJ)     00003980
ISN 0353         TY = AIC(2,1)*RX(JJ)+AIC(2,2)*RY(JJ)+AIC(2,3)*RZ(JJ)     00003990
ISN 0354         TZ = AIC(3,1)*RX(JJ)+AIC(3,2)*RY(JJ)+AIC(3,3)*RZ(JJ)     00004000
ISN 0355         XNP(JJ) = X(I)+TX                                        00004010
ISN 0356         YNP(JJ) = Y(I)+TY                                        00004020
ISN 0357         ZNP(JJ) = Z(I)+TZ                                        00004030
ISN 0358    4010 CONTINUE                                                 00004040
ISN 0359    4000 CONTINUE                                                 00004050
ISN 0360         IF(NOLEO.EQ.0) GO TO 4020                                00004060
ISN 0362         DO 4022 J=1,NOLEO                                        00004070
ISN 0363         YOLEO(J)=0.                                              00004080
ISN 0364    4024 YNEW=-FAO(J)*(EOLEO(J)/(EOLEO(J)-YOLEO(J)))**EXPOLE(J)   00004090
ISN 0365         YNEW=(YNEW+FAA(J))/XKEXT(J)                              00004100
ISN 0366         ERR=ABS(YNEW-YOLEO(J))                                   00004110
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ISN 0367          YOLEO(J)=YNEW
ISN 0368          IF(ERR.LT.0.0001) GO TO 4022
ISN 0370          GO TO 4024
ISN 0371     4022 CONTINUE
            C
            C     YOLEO = AXIAL COMPRESSSON DISTANCE OF STRUT MEASURED FROM THE
            C      FULLY EXTENDED POSITION
            C
ISN 0372     4020 IF(NIC.LE.0) RETURN
            C
            C     COMPUTE PREL. UNCOUPLED LOADS AND DEFLECTIONS
            C
ISN 0374          PRINT 5011
ISN 0375     5011 FORMAT(// 1X,'BEAM LOADS')
ISN 0376          PRINT 5012
ISN 0377     5012 FORMAT(// 6X,'BEAM',19X,'AXIAL LOAD',19X,'SHEAR FORCE',22X,
                *       'MOMENT',20X,'BEAM' / 2X,'IJ  I  J  M  N',3X,'BUCKLING',
                *       4X,'TENSION   COMPRESSION  LATERAL(Y) VERTICAL(Z)',3X,
                *       'ROLL(X)',5X,'PITCH(Y)',5X,'YAW(Z)',3X,'IJ  I  J  M  N' / )
ISN 0378          DO 2400 IJ=1,NB
ISN 0379          IF(YY(IJ) .LE. ZZ(IJ)) GO TO 5013
ISN 0381          YZMIN(IJ)=ZZ(IJ)
ISN 0382          GO TO 5014
            C     YZMIN = MIN.CROSS SECTION AREA INERTIA
ISN 0383     5013 YZMIN(IJ)=YY(IJ)
            C     CALC.FORCES AND MOMENTS
            C     AXIAL FORCES
ISN 0384     5014 PCRFFY=4.*PI*PI*E(IJ)*YY(IJ)/(XLB(IJ)**2)
ISN 0385          PCRFFZ=4.*PI*PI*E(IJ)*ZZ(IJ)/(XLB(IJ)**2)
ISN 0386          PTENS=STENS(MC(IJ))*AA(IJ)
ISN 0387          PCOMP=SCOMP(MC(IJ))*AA(IJ)
            C     SHEAR FORCES
ISN 0388          FY=.67*SHEAR(MC(IJ))*AA(IJ)
ISN 0389          FZ=FY
            C     MOMENTS
ISN 0390          IF(XIQ(IJ).NE.0.) GO TO 400
ISN 0392          TMOMX = 0.
ISN 0393          GO TO 410
ISN 0394      400 TMOMX=SHEAR(MC(IJ))/XIQ(IJ)
ISN 0395      410 SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))
ISN 0396          IF(Z1(IJ).NE.0.) GO TO 420
ISN 0398          BENDMY = 0.
ISN 0399          GO TO 430
ISN 0400      420 BENDMY=SYIELD*YY(IJ)/Z1(IJ)
ISN 0401      430 IF(Z2(IJ).NE.0.) GO TO 440
ISN 0403          BENDMZ = 0.
ISN 0404          GO TO 450
ISN 0405      440 BENDMZ=SYIELD*ZZ(IJ)/Z2(IJ)
            C
            C     CHECK BEAM END CONDITIONS.
            C
ISN 0406      450 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 100
ISN 0408          IF(PY(IJ).EQ.0.OR.PYJ(IJ).EQ.0) GO TO 110
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         C  PINNED-PINNED.
ISN 0410       PCRY = PCRFFY/4.
ISN 0411       BENDMY = 0.
ISN 0412       FZ = 0.
ISN 0413       GO TO 120
         C  FIXED-PINNED.
ISN 0414   110 PCRY = PCRFFY/2.
ISN 0415       GO TO 120
         C  FIXED-FIXED
ISN 0416   100 PCRY = PCRFFY
ISN 0417   120 IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 200
ISN 0419       IF(PZ(IJ).EQ.0.OR.PZJ(IJ).EQ.0) GO TO 210
         C  PINNED-PINNED.
ISN 0421       PCRZ = PCRFFZ/4.
ISN 0422       BENDMZ = 0.
ISN 0423       FY = 0.
ISN 0424       GO TO 220
         C  FIXED-PINNED.
ISN 0425   210 PCRZ = PCRFFZ/2.
ISN 0426       GO TO 220
         C  FIXED-FIXED
ISN 0427   200 PCRZ = PCRFFZ
ISN 0428   220 PCR(IJ) = PCRZ
ISN 0429       IF(PCRY.LT.PCRZ) PCR(IJ)=PCRY
ISN 0431  5018 PRINT 5015,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),PCR(IJ),PTENS,
              1 PCOMP,FY,FZ,TMOMX,BENDMY,BENDMZ,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ))
ISN 0432  5015 FORMAT(1X,5I3,1P8E12.4,5I3)
ISN 0433  2400 CONTINUE
ISN 0434       PRINT 5050
ISN 0435  5050 FORMAT(// 1X,'BEAM DEFLECTIONS')
ISN 0436       PRINT 5051
ISN 0437  5051 FORMAT(// 6X,'BEAM',17X,'DEFLECTION',25X,'TRANSLATION DUE TO',23X,
              *        'ROTATION ABOUT' / 2X,'IJ  I  J  M  N',2X,'BUCKLING',4X,
              *        'TENSION  COMPRESSION   F(Y)',7X,'F(Z)',7X,'BM(Z)',6X,
              *        'BM(Y)',5X,'X-AXIS      Y-AXIS      Z-AXIS' / )
         C
         C     CALC.DEFLECTIONS
         C
         C     AXIAL DEFLECTIONS
         C
ISN 0438       DO 2500 IJ=1,NB
ISN 0439       SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))
ISN 0440       IF(XK3(1,1,IJ) .EQ. 0.0) GO TO 5330
ISN 0442       XDEFB = PCR(IJ)/XK3(1,1,IJ)
ISN 0443       XDEFT=STENS(MC(IJ))*AA(IJ)/XK3(1,1,IJ)
ISN 0444       XDEFC=SCOMP(MC(IJ))*AA(IJ)/XK3(1,1,IJ)
ISN 0445       GO TO 5340
ISN 0446  5330 XDEFB = 0.0
ISN 0447       XDEFT = 0.0
ISN 0448       XDEFC = 0.0
ISN 0449  5340 CONTINUE
         C     DUE TO SHEAR FORCES
ISN 0450       IF(XK3(2,2,IJ) .EQ. 0.0) GO TO 5350
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ISN 0452          YDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(2,2,IJ)
ISN 0453          GO TO 5360
ISN 0454     5350 YDSF = 0.0
ISN 0455     5360 IF(XK3(3,3,IJ) .EQ. 0.0) GO TO 5370
ISN 0457          ZDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(3,3,IJ)
ISN 0458          GO TO 5380
ISN 0459     5370 ZDSF = 0.0
ISN 0460     5380 CONTINUE
            C     DEFL. DUE TO BEND.FORCE      ((K55/DEL)*FORCE)
ISN 0461          IF(XK3(2,2,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5390
ISN 0463          YMOMZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XLB(IJ)*XK3(2,2,IJ))
ISN 0464          GO TO 5400
ISN 0465     5390 YMOMZ = 0.0
ISN 0466     5400 IF(XK3(3,3,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5410
ISN 0468          ZMOMY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XLB(IJ)*XK3(3,3,IJ))
ISN 0469          GO TO 5420
ISN 0470     5410 ZMOMY = 0.0
ISN 0471     5420 CONTINUE
            C     TORSIONAL ROTATION
ISN 0472          IF(XK3(4,4,IJ).NE.0.AND.XIQ(IJ).NE.0.) GO TO 5317
ISN 0474          ROTX=0.0
ISN 0475          GO TO 5318
ISN 0476     5317 ROTX=SHEAR(MC(IJ))/XIQ(IJ)/XK3(4,4,IJ)
            C     BEND. ROTATION    ((K33/DEL)*MOM.)
ISN 0477     5318 IF(XK3(5,5,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5430
ISN 0479          ROTY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XK3(5,5,IJ))
ISN 0480          GO TO 5440
ISN 0481     5430 ROTY = 0.0
ISN 0482     5440 IF(XK3(6,6,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5450
ISN 0484          ROTZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XK3(6,6,IJ))
ISN 0485          GO TO 5460
ISN 0486     5450 ROTZ = 0.0
ISN 0487     5460 CONTINUE
ISN 0488     5316 PRINT 5319, (IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),XDEFB,XDEFT,XDEFC,
                 1 YDSF,ZDSF,YMOMZ,ZMOMY,ROTX,ROTY,ROTZ)
ISN 0489     5319 FORMAT(1X,5I3,1P10E11.3)
ISN 0490     2500 CONTINUE
ISN 0491          RETURN
ISN 0492          END
```

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*********************************************************************************************
*                                                                                           *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C          DATA SET D2334IFRNT AT LEVEL 009 AS OF 06/25/79
            C          DATA SET D2332GIR   AT LEVEL 002 AS OF 05/02/78          00000010
            C          DATA SET D2332VIR   AT LEVEL 004 AS OF 01/26/78          00000020
            C          DATA SET D2332MIR   AT LEVEL 008 AS OF 01/12/78          00000030
  ISN 0002        SUBROUTINE INPRNT                                             00000040
            C                                                                   00000050
  ISN 0003        IMPLICIT REAL*8 (A-H,O-Z)                                     00000060
  ISN 0004        REAL*8 KUN                                                    00000070
  ISN 0005        REAL*8 LBAR,MU,KE,CASEIN,CASOUT,MINDT                         00000080
  ISN 0006        REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)          00000090
  ISN 0007        INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150),RUNIN,RUNOUT      00000100
  ISN 0008        INTEGER*4 TITLE(40),BLANK,STOP                                00000110
  ISN 0009        INTEGER*4 DIR                                                 00000120
  ISN 0010        INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)           00000130
  ISN 0011        INTEGER*2 MQ(180),NQ(180)                                     00000140
  ISN 0012        INTEGER*2 CHUG,INBUFF,IIN,II(40),KK(40),INBUF(80)             00000150
  ISN 0013        INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR        00000160
  ISN 0014        INTEGER*2 N1,NN,IBS,IG,JG                                     00000170
  ISN 0015        INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE             00000180
  ISN 0016        INTEGER*2 NTOL1,NTOL2,NTOL3                                   00000190
  ISN 0017        INTEGER*2 IJSAVE(180)                                         00000200
  ISN 0018        INTEGER*2 NKMVEC(150)                                         00000210
  ISN 0019        INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)              00000220
  ISN 0020        DIMENSION G(150),XP(8),YP(8),ZP(8),VMAX2(6,150),FMAX2(6,150)  00000230
  ISN 0021        DIMENSION VMAX3(6,150),FMAX3(6,150)                           00000240
  ISN 0022        DIMENSION XK3(6,6,150)                                        00000250
  ISN 0023        DIMENSION IJPRT(14),VMAXT(6),FMAXT(6)                         00000260
  ISN 0024        DIMENSION MASSNO(50),DIR(50),NPTS(50)                         00000270
  ISN 0025        DIMENSION IPHDP(80)                                           00000280
  ISN 0026        DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)                       00000290
  ISN 0027        COMMON/IBALL/ IBUF1(20)                                       00000300
  ISN 0028        COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3), 00000310
                 1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000320
                 2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180), 00000330
                 3 MVP                                                          00000340
  ISN 0029        COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),       00000350
                 1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150), 00000360
                 2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                 00000370
  ISN 0030        COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),   00000380
                 1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)      00000390
  ISN 0031        COMMON/DOIN/ CBAR(150)                                        00000400
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ISN 0032        COMMON/DEIR/ PLM26(150),PLM35(150),PLM26J(150),PLM35J(150)        00000410
ISN 0033        COMMON/CFIR/ SIFL(40),SAFL(40),SBFL(40),SFFL(40),XKEFL(40)        00000420
ISN 0034        COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT       00000430
ISN 0035        COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),         00000440
               1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT           00000450
ISN 0036        COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10),    00000460
               *                NMPTS(10),MNUM(50,10),ISCALE(10)                  00000470
ISN 0037        COMMON/INDEAC/ NACC                                               00000480
ISN 0038        COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                 00000490
               1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,               00000500
               2 XGDOT,YGDOT,ZGDOT                                                00000510
ISN 0039        COMMON/INIDCP/ YDP(80)                                            00000520
ISN 0040        COMMON/INPR/  NORI,NSP                                            00000530
ISN 0041        COMMON/INCFIC/ BETA                                               00000540
ISN 0042        COMMON/IRDE/ PFIL                                                 00000550
ISN 0043        COMMON/MACFIN/ TMAX,IPRINT                                        00000560
ISN 0044        COMMON/MCFIII/ SYMFLG                                             00000570
ISN 0045        COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                                00000580
ISN 0046        COMMON/NP00I2/ MG,NG,INP,MNP                                      00000590
ISN 0047        COMMON/NP01I2/ II,KK,MM                                           00000600
ISN 0048        COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN                        00000610
ISN 0049        COMMON/NP00I4/ NNP                                                00000620
ISN 0050        COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                  00000630
ISN 0051        COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),        00000640
               1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),   00000650
               2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO         00000660
ISN 0052        COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000670
               1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),            00000680
               2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),           00000690
               3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),    00000700
               4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),  00000710
               5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,  00000720
               6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                             00000730
               7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,             00000740
               8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),           00000750
               9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),         00000760
               A CEIKF(40),                                                       00000770
               B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                            00000780
               C NM,NB,I,J,IG(150),JG(150),                                       00000790
               D N1(900),NN(40),IJPR(150)                                         00000800
ISN 0053        COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP                   00000810
ISN 0054        COMMON/COMMR8/ G                                                  00000820
ISN 0055        COMMON/UB/ DB(150),IJUB(150),NUB                                  00000830
ISN 0056        COMMON/STUFF/ NEWI(80),NEWIJ(150),NMOLD,NBOLD                     00000840
ISN 0057        COMMON/COMMR4/ KR     ,LDP    ,LDP1                               00000850
ISN 0058        COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,                         00000860
               1               NPH    ,NMTL   ,NPTS   ,NVBM   ,IJPRT  ,IPHDP,NFBM 00000870
ISN 0059        COMMON/COMMI2/ IQ           ,JQ             ,LQ     ,NPQ    ,INBUF ,  00000880
               1               NKMVEC,IJSAVE                                      00000890
ISN 0060        COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3                              00000900
ISN 0061        COMMON/IPIC/ NIC                                                  00000910
ISN 0062        COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)       00000920
ISN 0063        COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR     00000930
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ISN 0064          EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0065          EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))
ISN 0066          EQUIVALENCE(VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))
ISN 0067          EQUIVALENCE (MASSNO(1),INDEX(1,1))
ISN 0068          EQUIVALENCE (DIR(1),INDEX(1,2))
ISN 0069          SQRT(X) = DSQRT(X)
ISN 0070          ABS(X) = DABS(X)
ISN 0071          PI = 3.14159265350D0
             C
             C    CARD 0001,0002
             C
ISN 0072          PRINT 5500, TITLE
ISN 0073     5500 FORMAT(1H1,20A4,/,1X,20A4)
             C
             C    CARD 0003
             C
ISN 0074          PRINT 5504
ISN 0075     5504 FORMAT(//1X,'PROGRAM SIZE DATA',/)
             C
             C    CARD 0004
             C
ISN 0076          PRINT 5507,NM,NSP,NB,NLB,NHI,MVP,NVCH,NDRI,NMTL,NACC,NVBM,
                 1 NVBMN,NFBM,NFBMN,NPH,ND,NKM,NNP
ISN 0077     5507 FORMAT(1X,'NUMBER OF:',/,33X,'NON-',45X,'NON-',5X,'NON-',/,33X,
                 1 'ZERO',43X,'STANDARD',1X,'STANDARD',1X,'NON-',4X,'NON-',14X,
                 2 'NO.',/,27X,'KR',4X,'HE OR',4X,'MASS',3X,'VOLUME',3X,'DRI',5X,
                 3 'MTL ',3X,'ACCEL.',3X,'MAX.',5X,'MAX.',3X,'ZERO',2X,
                 4 'STANDARD STIFFNESS NODE',/,1X,'MASSES',2X,'SPRINGS',
                 5 2X,'BEAMS',2X,'TABLES',3X,'IXY',4X,'PENETR.',1X,
                 6 'CHANGE',1X,'ELEMENTS',1X,'TYPES',3X,'TABLES',2X,'DEFL.',4X,
                 7 'FORCE',2X,5HPHI'',2X,'DAMPING',2X,'MATRICES  PTS.',/,
                 8 82X,'NVB',6X,'NFB',/,3X,'NM',
                 9 6X,'NSP',5X,'NB',5X,'NLB',5X,'NHI',5X,'MVP',5X,'NVCH',4X,
                 A 'NDRI',3X,'NMTL',5X,'NACC',3X,'+',3X,'-',3X,'+',3X,'-',4X,
                 B 'NPH',6X,'ND',7X,'NKM',5X,'NNP',/,
                 C 1X,I4,2I8,I7,I8,I8,I9,I8,I7,I9,I5,3(I4),I7,2I9,I8)
ISN 0078          PRINT 5961,NSC,NIC,NTOL1,NTOL2,NTOL3
ISN 0079     5961 FORMAT(/,2X,'NSC=',I5,5X,'NIC=',I5,5X,'NTOL1=',I5,'%',
                 1 5X,'NTOL2=',I5,'%',5X,'NTOL3=',I5,'%')
ISN 0080          PRINT 5962,NOLEO,ALPHAP
ISN 0081     5962 FORMAT(/,2X,'NO.OF OLEO STRUTS=',I5,5X,'ALPHA=',P1E10.3)
ISN 0082          PRINT 1000,CASEIN,CASOUT,RUNIN,RUNOUT,MSECIN,MSCOUT
ISN 0083     1000 FORMAT(//2X,'PROGRAM DATA MANAGEMENT CONTROL DATA',
                 1       //10X,'RESTART:',T20,'TITLE - ',A8,
                 2         T50,'SAVE:'   ,T56,'TITLE - ',A8,
                 3        /T20,'CASE  - ',I4,T56,'CASE  - ',I4,
                 4        /T20,'TIME  - ',I4,T56,'TIMES - ',5I4)
ISN 0084          PRINT 1008,IVAR,EL,EU,RATMIN,RATMAX
ISN 0085     1008 FORMAT(///2X,'VARIABLE INTEGRATION CONTROL DATA',
                 1        //5X,'VAR. INT. FLAG = ',I1,
                 2          2X,'EL = ',F6.3,2X,'EU = ',F6.3,
                 3          2X,'LOWER RATIO = ',F5.2,2X,'UPPER RATIO = ',F5.2)
ISN 0086          PRINT 5501
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ISN 0087      5501 FORMAT(//,1X,'PROGRAM CONTROL DATA',//,
                 1  3X,'PRINT INTERVAL/',11X,'INTEGRATION',9X,'MAX.',10X,
                 2 'PLOW FORCE',9X,'FILTER CUTOFF',7X,'CASE TYPE',/,
                 3              1X,'INTEGRATION INTERVAL',9X,'INTERVAL',11X,'TIME',
                 4 9X,'STARTING TIME',9X,'FREQUENCY',9X,'INDICATOR',//,
                 5 8X,'DP/DT',20X,'DT',14X,'TMAX',13X,'PLOWT',15X,'FCUT',14X,
                 6 'RUNMOD')
ISN 0088           PRINT 5503,    IPRINT,DELTAT,TMAX,PLOWT,FCUT,RUNMOD
ISN 0089      5503 FORMAT(8X,I4,18X,F8.6,9X,F8.6,12X,F7.5,10X,F7.3,12X,F7.3)
ISN 0090           IF(FCUT.EQ.0.) GO TO 5509
ISN 0092           PFIL = 1./(2.*PI*FCUT)
ISN 0093           GO TO 5511
ISN 0094      5509 PFIL = 0.
              C
              C    CARD 0005,006,007
              C
ISN 0095      5511 PRINT 3000,NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP
ISN 0096      3000 FORMAT(//,1X,'TIME HISTORY PRINT CONTROL CARDS',//
                 1 2X,'STRAIN',3X,'TOTAL',4X,'BEAM',6X,'EXT.SPRING',
                 2 2X,'ENERGY',2X,'STRESS',2X,'ACCEL',2X,'IMPULSE',/2X,'FORCES',
                 3 2X,'FORCES',1X,'DEFLECTIONS',5X,'DATA',6X,'DATA',
                 4 4X,'DATA',3X,'DATA',3X,'DATA',/4X,I2,I8,I9,I12,I11,I8,I7,I8)
ISN 0097           IF(NPLT.EQ.0) GO TO 5519
ISN 0099      5513 PRINT 3002,NPLT,NPFCT
ISN 0100      3002 FORMAT(//,1X,'NO.OF MASS POSITION PLOTS EACH TIME=',I5,10X,
                 *        'PLOT PRINT FACTOR =',I5)
ISN 0161           PRINT 3003
ISN 0102      3003 FORMAT(//,1X,'PLANE I.D.',5X,'NO.OF POINTS')
ISN 0103           PRINT 3004,(ITPL(J),NMPTS(J),J=1,NPLT)
ISN 0104      3004 FORMAT(3X,I5,8X,I5)
ISN 0105           GO TO 5510
ISN 0106      5519 PRINT 3001
ISN 0107      3001 FORMAT(//,1X,'NO.MASS POSITION PLOTS')
ISN 0108      5510 PRINT 4000
ISN 0109      4000 FORMAT(//,1X,'VEHICLE INITIAL CONDITIONS',//,
                 1 1X,'VEHICLE TRANSLATIONAL VELOCITIES IN GROUND AXES (IN/SEC)',/
                 2 1X,'VEHICLE ROTATIONAL VELOCITIES IN VEHICLE AXES (RAD/SEC)',/
                 3 1X,'EULER ANGLES OF VEHICLE RELATIVE TO GROUND (RADIANS)',//
                 4 9X,'XGDOT',13X,'YGDOT',13X,'ZGDOT',/,11X,'P''',16X,'Q''',16X,
                 5 'R''',/,10X,'PHI''',13X,'THETA''',13X,'PSI''',/)
ISN 0110           PRINT 5502, XGDOT,YGDOT,ZGDOT
ISN 0111           PRINT 5502, PPR,QPR,RPR
ISN 0112           PRINT 5502, PHIPR,THEPR,PSIPR
ISN 0113      5502 FORMAT(3(5X,1PE13.5))
ISN 0114           PRINT 4003
ISN 0115      4003 FORMAT(/,1X,'GENERALIZED SURFACE DATA',/)
ISN 0116           PRINT 3999,BETA,XGIN,ZGIN
ISN 0117      3999 FORMAT(1X,'BETA = ',F5.1,' DEGREES',/,1X,'XGIN = ',F5.1,/,
                 1 1X,'ZGIN = ',F5.1)
              C
              C    BEAM AND MASS NUMBERING CORRESPONDENCE (LEFT/RIGHT) DATA
              C
ISN 0118           IF(RUNMOD.LT.2) GO TO 1010
```

```
ISN 0120          NMAX = MAX0(NMOLD,NBOLD)                                     00002000
ISN 0121          PRINT 1050                                                   00002010
ISN 0122     1050 FORMAT(//,1X,'CORPESPONDING MASS AND BEAM NUMBERS FOR',      00002020
                 1      ' LEFT AND RIGHT SIDES OF AIRPLANE')                   00002030
ISN 0123          PRINT 1051                                                   00002040
ISN 0124     1051 FORMAT(/3X,'MASSES',23X,'BEAMS'//1X,'LEFT  RIGHT',12X,'LEFT', 00002050
                 1       14X,'RIGHT'/3X,'I',5X,'I',9X,'IJ  I  J  M  N    IJ  ', 00002060
                 2       'I  J  M  N')                                         00002070
ISN 0125          DO 1020 I=1,NMAX                                             00002080
ISN 0126          IF(I.GT.NMOLD) GO TO 1030                                    00002090
ISN 0128          IF(I.GT.NBOLD) GO TO 1040                                    00002100
ISN 0130          INEW = NEWI(I)                                               00002110
ISN 0131          IJNEW = NEWIJ(I)                                             00002120
ISN 0132          IF(IJNEW.NE.0) GO TO 1042                                    00002130
ISN 0134          IGT = 0                                                      00002140
ISN 0135          JGT = 0                                                      00002150
ISN 0136          MGT = 0                                                      00002160
ISN 0137          NGT = 0                                                      00002170
ISN 0138          GO TO 1044                                                   00002180
ISN 0139     1042 IGT = IG(IJNEW)                                              00002190
ISN 0140          JGT = JG(IJNEW)                                              00002200
ISN 0141          MGT = MG(IJNEW)                                              00002210
ISN 0142          NGT = NG(IJNEW)                                              00002220
ISN 0143     1044 PRINT 1052,I,INEW,I,IG(I),JG(I),MG(I),NG(I),IJNEW,IGT,JGT,MGT,NGT 00002230
ISN 0144          GO TO 1020                                                   00002240
ISN 0145     1030 IJNEW = NEWIJ(I)                                             00002250
ISN 0146          IF(IJNEW.NE.0) GO TO 1046                                    00002260
ISN 0148          IGT = 0                                                      00002270
ISN 0149          JGT = 0                                                      00002280
ISN 0150          MGT = 0                                                      00002290
ISN 0151          NGT = 0                                                      00002300
ISN 0152          GO TO 1048                                                   00002310
ISN 0153     1046 IGT = IG(IJNEW)                                              00002320
ISN 0154          JGT = JG(IJNEW)                                              00002330
ISN 0155          MGT = MG(IJNEW)                                              00002340
ISN 0156          NGT = NG(IJNEW)                                              00002350
ISN 0157     1048 PRINT 1053,I,IG(I),JG(I),MG(I),NG(I),IJNEW,IGT,JGT,MGT,NGT   00002360
ISN 0158          GO TO 1020                                                   00002370
ISN 0159     1040 PRINT 1052,I,NEWI(I)                                         00002380
ISN 0160     1020 CONTINUE                                                     00002390
ISN 0161     1052 FORMAT(2X,I2,4X,I2,5X,2(3X,5I3))                             00002400
ISN 0162     1053 FORMAT(15X,2(3X,5I3))                                        00002410
ISN 0163     1010 PRINT 5498                                                   00002420
ISN 0164     5498 FORMAT(//,1X,'MASS DATA')                                    00002430
ISN 0165          PRINT 5499                                                   00002440
ISN 0166     5499 FORMAT(//,9X,'WEIGHTS',11X,'MASS COORDINATES F.S.,B.L.,W.L.',10X, 00002450
                 1 'MASS MOMENTS OF INERTIA (LB-IN-SEC**2)',/)                 00002460
ISN 0167          PRINT 5505                                                   00002470
ISN 0168     5505 FORMAT(2X,'I',8X,'W',14X,3HX'',12X,3HY'',12X,3HZ'',12X,'IX', 00002480
                 1 13X,'IY',13X,'IZ',10X,'I')                                  00002490
             C                                                                 00002500
             C    CARDS 0100                                                   00002510
             C                                                                 00002520
```

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ISN 0169          PRINT 5506, (I,WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),I,  00002530
                 1 I=1,NM)                                                          00002540
ISN 0170      5506 FORMAT(1X,I2,1P7E15.5,4X,I2)                                     00002550
             C                                                                      00002560
             C    CARDS 0200                                                        00002570
             C                                                                      00002580
ISN 0171          IF(NNP.EQ.0) GO TO 5534                                           00002590
ISN 0173          PRINT 2000                                                        00002600
ISN 0174      2000 FORMAT(//,1X,'NODE POINT DATA',//,                               00002610
                 1 3X,'MASS',2X,'N.P.',4X,'NODE POINT COORDINATES F.S.,B.L.,W.L.',  00002620
                 2 /,5X,'I',4X,'M',8X,3HX'',11X,3HY'',12X,3HZ'')                    00002630
ISN 0175          PRINT 4001,(INP(I),MNP(I),XNPDP(I),YNPDP(I),ZNPDP(I),I=1,NNP)     00002640
ISN 0176      4001 FORMAT(1X,2I5,1P3E15.5)                                          00002650
             C                                                                      00002660
             C    CARDS 0300                                                        00002670
             C                                                                      00002680
ISN 0177      5534 IF(NSP.EQ.0) GO TO 5535                                          00002690
ISN 0179          PRINT 4004                                                        00002700
ISN 0180      4004 FORMAT(///,1X,'EXTERNAL SPRING DATA')                            00002710
ISN 0181          PRINT 4008                                                        00002720
ISN 0182      4008 FORMAT(//,17X,'FREE',9X,'FRICTION',7X,'BOTTOMING',7X,'PLOWING',  00002730
                 1 8X,'GROUND',/,                                                   00002740
                 2 5X,'SPRING',5X,'LENGTH',7X,'COEFFICIENT',6X,'SPRING',9X,'FORCE', 00002750
                 3 8X,'FLEXIBILITY',/)                                              00002760
ISN 0183          PRINT 5515                                                        00002770
ISN 0184      5515 FORMAT(3X,'I',2X,'K',2X,'M',                                     00002780
                 1 5X,'LBAR(IKM)',6X,'MU(IKM)',8X,'KE(IKM)',8X,                     00002790
                 2 'FORCE(IKM)',5X,'GFLEX(IKM)')                                    00002800
ISN 0185          PRINT 5516,(II(J),KK(J),MM(J),XLBAR(J),XMU(J),XKE(J),XMAX(J),     00002810
                 1 GFLEX(J),J=1,NSP)                                                00002820
ISN 0186      5516 FORMAT(1H ,3I3,1P5E15.5)                                         00002830
ISN 0187          PRINT 4009                                                        00002840
ISN 0188      4009 FORMAT(/2X'SPRING',23X,'DEFLECTION COORDINATES',25X,'SPRING AXIAL 00002850
                 1FORCES',/)                                                        00002860
ISN 0189          PRINT 5517                                                        00002870
ISN 0190      5517 FORMAT(3X,'I',2X,'K',2X,'M',6X,'SI(IKM)',8X,'SA(IKM)',8X,        00002880
                 1 'SB(IKM)',8X,'SF(IKM)',7X,'FSPOI(IKM)',5X,'FSPOF(IKM)',6X,       00002890
                 2  'CRIT.DAMP',4X,'CDAMP(IKM)')                                    00002900
             C                                                                      00002910
             C  CALCULATE SPRING TABLE PARAMETERS INCLUDING FLEXIBLE GROUND EFFECTS. 00002920
             C                                                                      00002930
ISN 0191          DO 10 J=1,NSP                                                     00002940
ISN 0192          SIFL(J) = SI(J) + FSPOI(J)*GFLEX(J)                               00002950
ISN 0193          SAFL(J) = SA(J) + FSPOI(J)*GFLEX(J)                               00002960
ISN 0194          SBFL(J) = SB(J) + FSPOF(J)*GFLEX(J)                               00002970
ISN 0195          SFFL(J) = SF(J) + FSPOF(J)*GFLEX(J)                               00002980
ISN 0196          IF(XKE(J).EQ.0.) GO TO 20                                         00002990
ISN 0198          XKEFL(J) = 1./(GFLEX(J)+1./XKE(J))                                00003000
ISN 0199          GO TO 10                                                          00003010
ISN 0200        20 XKEFL(J) = 0.                                                    00003020
ISN 0201        10 CONTINUE                                                         00003030
             C                                                                      00003040
             C    CARDS 0400                                                        00003050
```

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                   C                                                                    00003060
ISN 0202                 DO 5160 IKM=1,NSP                                              00003070
ISN 0203                 I = II(IKM)                                                    00003080
ISN 0204                 K = KK(IKM)                                                    00003090
ISN 0205                 M = MM(IKM)                                                    00003100
ISN 0206                 XKUN=FSPOI(IKM)/SI(IKM)                                        00003110
ISN 0207                 SRT=2.*SQRT(XKUN*WGT(I)/386.4)*CDAMP(IKM)                      00003120
                   C      SRT=2*CRIT.DAMPING*SQRT(K*M)                                  00003130
ISN 0208                 PRINT 5518,I,K,M,SI(IKM),SA(IKM),SB(IKM),SF(IKM),FSPOI(IKM),   00003140
                        1 FSPOF(IKM),CDAMP(IKM),SRT                                     00003150
ISN 0209             5518 FORMAT(1H,3I3,1P8E15.5)                                       00003160
ISN 0210                 CDAMP(IKM)=SRT                                                 00003170
ISN 0211             5160 CONTINUE                                                      00003180
                   C                                                                    00003190
                   C     CARDS 0500                                                     00003200
                   C                                                                    00003210
                   C     MAT.PROP.VALUES                                                00003220
                   C     MC=1(4130 STEEL),2(6150H STEEL),3(STAINLESS 3000 SERIES),      00003230
                   C      4(AL.2024-T3),5(AL.6061-T3),6(CAST AL.B195-T4)                00003240
                   C      7(LOW MOD.MAT.),8(JUNK),9,10(SPINE FOR DRI)                   00003250
                   C                                                                    00003260
ISN 0212                 EE(1)=30.E06                                                   00003270
ISN 0213                 EE(2)=30.E06                                                   00003280
ISN 0214                 EE(3)=28.E06                                                   0000329C
ISN 0215                 EE(4)=10.5E06                                                  00003300
ISN 0216                 EE(5)=10.0E06                                                  00003310
ISN 0217                 EE(6)=EE(5)                                                    00003320
ISN 0218                 EE(7)=1.0E06                                                   00003330
ISN 0219                 EE(8)=1.0E06                                                   00003340
ISN 0220                 EE(9)=1.0E06                                                   00003350
ISN 0221                 EE(10)=1.0E06                                                  00003360
ISN 0222                 GG(1)=11.0E06                                                  00003370
ISN 0223                 GG(2)=GG(1)                                                    00003380
ISN 0224                 GG(3)=12.5E06                                                  00003390
ISN 0225                 GG(4)= 4.0E06                                                  00003400
ISN 0226                 GG(5)= 3.8E06                                                  00003410
ISN 0227                 GG(6)= 3.8E06                                                  00003420
ISN 0228                 GG(7)= .30E06                                                  00003430
ISN 0229                 GG(8)= 0.                                                      00003440
ISN 0230                 GG(9)= .30E06                                                  00003450
ISN 0231                 GG(10)= .30E06                                                 00003460
ISN 0232                 STENS(1)=75000.                                                00003470
ISN 0233                 STENS(2)=205000.                                               00003480
ISN 0234                 STENS(3)=70000.                                                00003490
ISN 0235                 STENS(4)=47000.                                                00003500
ISN 0236                 STENS(5)=35000.                                                00003510
ISN 0237                 STENS(6)=16000.                                                00003520
ISN 0238                 STENS(7)=16000.                                                00003530
ISN 0239                 STENS(8)=16000.                                                00003540
ISN 0240                 STENS(9)=16000.                                                00003550
ISN 0241                 STENS(10)=16000.                                               00003560
ISN 0242                 SCOMP(1)=75000.                                                00003570
ISN 0243                 SCOMP(2)=205000.                                               00003580
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ISN 0244          SCOMP(3)=46000.
ISN 0245          SCOMP(4)=39000.
ISN 0246          SCOMP(5)=34000.
ISN 0247          SCOMP(6)=16000.
ISN 0248          SCOMP(7)=16000.
ISN 0249          SCOMP(8)=16000.
ISN 0250          SCOMP(9)=16000.
ISN 0251          SCOMP(10)=16000.
ISN 0252          SHEAR(1)=37500.
ISN 0253          SHEAR(2)=80000.
ISN 0254          SHEAR(3)=36000.
ISN 0255          SHEAR(4)=22000.
ISN 0256          SHEAR(5)=17000.
ISN 0257          SHEAR(6)=17000.
ISN 0258          SHEAR(7)=17000.
ISN 0259          SHEAR(8)=17000.
ISN 0260          SHEAR(9)=17000.
ISN 0261          SHEAR(10)=17000.
ISN 0262     5535 DO 5306 IJ=1,NB
ISN 0263          IF(NKMVEC(IJ).NE.0) GO TO 5306
ISN 0265          DO 5305 L=1,6
ISN 0266          DO 5305 K=1,6
ISN 0267          XK3(L,K,IJ) = 0.
ISN 0268     5305 CONTINUE
ISN 0269     5306 CONTINUE
            C     CALCULATE BEAM LENGTHS
ISN 0270          DO 5054 IJ=1,NB
ISN 0271          I = IG(IJ)
ISN 0272          J = JG(IJ)
ISN 0273          M = MG(IJ)
ISN 0274          N = NG(IJ)
            C
            C     FIRST ASSUME BEAM ENDS ARE AT MASS POINTS.
            C
ISN 0275          XDPI = XDP(I)
ISN 0276          YDPI = YDP(I)
ISN 0277          ZDPI = ZDP(I)
ISN 0278          IF(J.EQ.0) GO TO 5212
ISN 0280          XDPJ = XDP(J)
ISN 0281          YDPJ = YDP(J)
ISN 0282          ZDPJ = ZDP(J)
ISN 0283     5212 IF(M.EQ.0.AND.N.EQ.0) GO TO 5210
            C
            C     IF NOT,AT LEAST ONE BEAM END CONNECTS TO A NODE POINT RATHER
            C     THAN A MASS POINT.
            C
            C     FIRST CHECK END I.
            C
ISN 0285          IF(M.EQ.0) GO TO 5220
ISN 0287          DO 5230 JJ=1,NNP
ISN 0288          IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 5240
ISN 0290     5230 CONTINUE
ISN 0291     5240 XDPI = XNPDP(JJ)
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ISN 0292          YDPI = YNPDP(JJ)
ISN 0293          ZDPI = ZNPDP(JJ)
ISN 0294     5220 IF(N.EQ.0) GO TO 5210
ISN 0296          DO 5260 JJ=1,NNP
ISN 0297          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5270
ISN 0299     5260 CONTINUE
ISN 0300     5270 XDPJ = XNPDP(JJ)
ISN 0301          YDPJ = YNPDP(JJ)
ISN 0302          ZDPJ = ZNPDP(JJ)
ISN 0303     5210 IF(J.NE.0) GO TO 5299
            C
            C     FOR A SYMMETRICAL MODEL,DATA FOR POINT J DOES NOT EXIST.
            C
ISN 0305          XLB(IJ) = 2.*ABS(YDPI)
ISN 0306          GO TO 5054
ISN 0307     5299 DELXDP = XDPJ-XDPI
ISN 0308          DELYDP = YDPJ-YDPI
ISN 0309          DELZDP = ZDPJ-ZDPI
ISN 0310          XLB(IJ) = SQRT(DELXDP*DELXDP+DELYDP*DELYDP+DELZDP*DELZDP)
ISN 0311     5054 CONTINUE
ISN 0312          FRINT 5301
ISN 0313     5301 FORMAT(//,1X,'MATERIAL PROPERTIES')
ISN 0314          PRINT 5309
ISN 0315     5309 FORMAT(//,2X,'MATERIAL',5X,'MODULUS OF',10X,
                 1 'MODULUS OF',10X,'TENSION',10X,'COMPRESS.',11X,
                 2 'SHEAR',/4X,'NO.',8X,'ELASTICITY',
                 3 11X,'RIGIDITY',11X,'STRESS',13X,'STRESS',11X,'STRESS',/)
ISN 0316          PRINT 5310,(IJ,EE(IJ),GG(IJ),STENS(IJ),SCOMP(IJ),
                 1 SHEAR(IJ),IJ=1,10)
ISN 0317     5310 FORMAT(4X,I2,7X,1PE12.4,8X,E12.4,9X,0PF8.0,10X,F8.0,10X,F8.0)
ISN 0318          IF(NMTL.EQ.0) GO TO 200
ISN 0320          DO 2 LL=1,NMTL
ISN 0321          IJ = IBUF1(LL)
ISN 0322          PRINT 5310,IJ,EE(IJ),GG(IJ),STENS(IJ),SCOMP(IJ),SHEAR(IJ)
ISN 0323        2 CONTINUE
            C     COMPUTE STIFFNESS MATRIX
ISN 0324      200 DO 5307 IJ=1,NB
ISN 0325          IF(NKMVEC(IJ).NE.0) GO TO 5307
ISN 0327          E(IJ)=EE(MC(IJ))
ISN 0328          G(IJ)=GG(MC(IJ))
ISN 0329          EOL = E(IJ)/XLB(IJ)
ISN 0330          EOL2 = EOL/XLB(IJ)
ISN 0331          EOL3 = EOL2/XLB(IJ)
            C
            C  FOR MAN AND DRI TYPE ELEMENTS (TYPES 9 AND 10), CALCULATE AREA
            C  AND DAMPING. THESE OVERRIDE ANY INPUT VALUES.
            C
ISN 0332          IF(MC(IJ).EQ.9) GO TO 30
ISN 0334          IF(MC(IJ).EQ.10) GO TO 40
ISN 0336          GO TO 100
            C
            C  MAN ELEMENT.
            C
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ISN 0337      30 AA(IJ) = 10.2276E-6*XLB(IJ)*WGT(JG(IJ))
ISN 0338         CBAR(IJ) = 0.3*SQRT(1. + WGT(JG(IJ))/WGT(IG(IJ)) )
ISN 0339         GO TO 100
              C
              C  DRI ELEMENT.
              C
ISN 0340      40 AA(IJ) = 6.5456E-6*XLB(IJ)*WGT(JG(IJ))
ISN 0341         CBAR(IJ) = 0.22*SQRT(1. + WGT(JG(IJ))/WGT(IG(IJ)) )
ISN 0342         IJPR(IJ) = 1
ISN 0343     100 XK3(1,1,IJ) = EOL*AA(IJ)
ISN 0344         XK3(2,2,IJ) = EOL3*12.*ZZ(IJ)
ISN 0345         XK3(3,3,IJ) = EOL3*12.*YY(IJ)
ISN 0346         XK3(4,4,IJ) = G(IJ)*XJ(IJ)/XLB(IJ)
ISN 0347         XK3(5,5,IJ) = EOL*4.*YY(IJ)
ISN 0348         XK3(6,6,IJ) = EOL*4.*ZZ(IJ)
ISN 0349         XK3(2,6,IJ) = EOL2*(-6.)*ZZ(IJ)
ISN 0350         XK3(5,3,IJ) = EOL2*6.*YY(IJ)
ISN 0351         XK3(3,5,IJ) = EOL2*6.*YY(IJ)
ISN 0352         XK3(6,2,IJ) = EOL2*(-6.)*ZZ(IJ)
ISN 0353    5307 CONTINUE
              C
              C     CARDS 0601 AND UP
              C
ISN 0354         PRINT 5308
ISN 0355    5308 FORMAT(//,1X,'INTERNAL BEAM DATA')
ISN 0356         PRINT 5302
ISN 0357    5302 FORMAT(//,55X,'DISTANCES FROM NEUTRAL',30X,'M',/,55X,
               1 'AXIS TO EXTREME FIBRES TORSION',13X,'DAMPING  T',/,7X,'BEAM',
               2 8X,'AREA',9X,'MOMENTS OF INERTIA',7X,'ZBIJ AXIS YBIJ AXIS ',
               3 'PARAMETER  LENGTH',5X,'RATIO   L P-CODES      BEAM',/
               4 109X,'Y Z Y Z')
ISN 0358         PRINT 5303
ISN 0359    5303 FORMAT(2X,'IJ  I  J  M  N    A',8X,'IYY',7X,'IZZ',
               1 8X,'JX',8X,'Z1',8X,'Z2',8X,'XIQ',6X,'XLB',7X,'CBAR   ',
               2 'MC I I J J IJ  I  J  M  N')
ISN 0360         PRINT 5304,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),AA(IJ),YY(IJ),
               1 ZZ(IJ),XJ(IJ),Z1(IJ),Z2(IJ),XIQ(IJ),XLB(IJ),CBAR(IJ),
               2 MC(IJ),PY(IJ),PZ(IJ),PYJ(IJ),PZJ(IJ),IJ,IG(IJ),JG(IJ),
               3 MG(IJ),NG(IJ),IJ=1,NB)
ISN 0361    5304 FORMAT(1X,5I3,1P9E10.3,5I2,5I3)
              C
              C  UNSYMMETRICAL BEAM CARDS.
              C
ISN 0362         IF(NUB.EQ.0) GO TO 4050
ISN 0364         PRINT 4022
ISN 0365    4022 FORMAT(//,1X,'UNSYMMETRICAL BEAM DATA')
ISN 0366         PRINT 4024
ISN 0367    4024 FORMAT(/,20X,'TENSION-',/,18X,'COMPRESSION',/,6X,
               1       'BEAM',11X,'FLAG',5X,'DEADBAND')
ISN 0368         PRINT 4026
ISN 0369    4026 FORMAT(/,2X,'IJ  I  J  M  N',5X,'IJUB',8X,'DB')
ISN 0370         DO 4028 IJ=1,NB
ISN 0371         IF(IJUB(IJ).EQ.0) GO TO 4028
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ISN 0373        PRINT 4030,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),IJUB(IJ),DB(IJ)
ISN 0374   4030 FORMAT(1X,5I3,I8,4X,1P1E10.3)
ISN 0375   4028 CONTINUE
          C
          C      PINNED-END BEAMS AND PLASTIC HINGES
          C
ISN 0376   4050 IF(NPIN.EQ.0) GO TO 4020
ISN 0378        PRINT 4052
ISN 0379   4052 FORMAT(//,1X,'PLASTIC HINGE AND END-FIXITY DATA')
ISN 0380        PRINT 4053
ISN 0381   4053 FORMAT(/,6X,'BEAM',7X,'P-CODES',13X,'SHAPE FACTORS',25X,'PLASTIC',
              1 1X,'HINGE MOMENTS')
ISN 0382        PRINT 4054
ISN 0383   4054 FORMAT(/,2X,'IJ  I  J  M  N IYIZJYJZ',4X,'SF35',4X,'SF26',4X,
              1 'SF35J',3X,'SF26J',3X,'PLM35',7X,'PLM26',7X,'PLM35J',6X,'PLM26J')
ISN 0384   4055 FORMAT(1X,5I3,1X,4I2,3X,4(F6.3,2X),4(1P1E10.3,2X))
ISN 0385        DO 4056 IJ=1,NB
ISN 0386        IF(PY(IJ).EQ.0 .AND.PZ(IJ).EQ.0.AND.PYJ(IJ).EQ.0.AND.
              1 PZJ(IJ).EQ.0) GO TO 4056
ISN 0388        PLM26(IJ)=SF26(IJ)*STENS(MC(IJ))*ZZ(IJ)/Z2(IJ)
ISN 0389        PLM35(IJ)=SF35(IJ)*STENS(MC(IJ))*YY(IJ)/Z1(IJ)
ISN 0390        PLM26J(IJ)=SF26J(IJ)*STENS(MC(IJ))*ZZ(IJ)/Z2(IJ)
ISN 0391        PLM35J(IJ)=SF35J(IJ)*STENS(MC(IJ))*YY(IJ)/Z1(IJ)
ISN 0392        I=IG(IJ)
ISN 0393        J=JG(IJ)
ISN 0394        M=MG(IJ)
ISN 0395        N=NG(IJ)
ISN 0396        PRINT 4055,IJ,I,J,M,N,PY(IJ),PZ(IJ),PYJ(IJ),PZJ(IJ),SF35(IJ),
              1 SF26(IJ),SF35J(IJ),SF26J(IJ),PLM35(IJ),PLM26(IJ),PLM35J(IJ),
              2 PLM26J(IJ)
ISN 0397   4056 CONTINUE
          C
          C     CARDS 0700
          C
ISN 0398   4020 IF(NOLEO.EQ.0) GO TO 4021
ISN 0400        PRINT 4031
ISN 0401   4031 FORMAT(///,1X,'OLEO STRUT BEAM DATA'//)
ISN 0402        PRINT 4032
ISN 0403   4032 FORMAT( 20X,'BEAM AIR CURVE PARAMETERS')
ISN 0404        PRINT 4033
ISN 0405   4033 FORMAT(/2X,'IJ  I  J  M  N',7X,'EOLEO',7X,'FAO',7X,'FAA',5X,
              1 'EXPOLE',5X,'YMAX')
ISN 0406        DO 4042 J=1,NOLEO
ISN 0407        DO 4041 IJ=1,NB
ISN 0408        IF(IGOLEO(J).EQ.IG(IJ).AND.JGOLEO(J).EQ.JG(IJ).AND.MGOLEO(J)
              1 .EQ.MG(IJ).AND.NGOLEO(J).EQ.NG(IJ)) GO TO 4045
ISN 0410   4041 CONTINUE
ISN 0411   4045 PRINT 4034,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),EOLEO(J),FAO(J),
              1 FAA(J),EXPOLE(J),YMAX(J)
ISN 0412   4034 FORMAT(1X,5I3,5X,1P5E10.3)
ISN 0413   4042 CONTINUE
ISN 0414        PRINT 4035
ISN 0415   4035 FORMAT(/20X,'BEAM DAMPING CONSTANTS,COULOMB FRICTION AND LINEAR '
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                 1 'SPRINGS (EXTENSION&COMPRESSION)')
ISN 0416           PRINT 4036
ISN 0417      4036 FORMAT(/2X,'IJ  I  J  M  N',8X,'BOLEO',4X,'BROLEO',5X,'XKEXT',
                 1 5X,'XKCOMP',4X, FCOUL')
ISN 0418           DO 4044 J=1,NOLEO
ISN 0419           DO 4043 IJ=1,NB
ISN 0420           IF(IGOLEO(J).EQ.IG(IJ).AND.JGOLEO(J).EQ.JG(IJ).AND.MGOLEO(J)
                 1 .EQ.MG(IJ).AND.NGOLEO(J).EQ.NG(IJ)) GO TO 4046
ISN 0422      4043 CONTINUE
ISN 0423      4046 PRINT 4034,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),BOLEO(J),BROLEO(J),
                 1 XKEXT(J),XKCOMP(J),FCOUL(J)
ISN 0424      4044 CONTINUE
ISN 0425      4021 IF(NLB.EQ.0) GO TO 5540
ISN 0427           PRINT 4014
ISN 0428      4014 FORMAT(///,1X,'NONLINEAR BEAM DATA',//)
ISN 0429           PRINT 4015
ISN 0430      4015 FORMAT(42X,'STANDARD',9X,'LINEAR',7X,'BOTTOMING',/,
                 1 13X,'BEAM',13X,'DIRECTION',3X,'TABLE NO.',6X,'DEFLECTION',5X,
                 2 'DEFLECTION',/)
ISN 0431           PRINT 5930
ISN 0432      5930 FORMAT(4X,'IJ',4X,'I',4X,'J',4X,'M',4X,'N',8X,'L',
                 1 11X,'NP',12X,'LDP',12X,'LDP1')
ISN 0433           PRINT 5940,(IJSAVE(I),IQ(I),JQ(I),MQ(I),NQ(I),LQ(I),
                 1 NPQ(I),LDP(I),LDP1(I),I=1,NLB)
ISN 0434      5940 FORMAT(1X,5I5,4X,I5,8X,I5,5X,1P2E15.5)
ISN 0435           K = -14
ISN 0436           DO 5070 I = 1,NLB
ISN 0437           NP = NPQ(I)
ISN 0438           IF(NP.LE.15) GO TO 5055
             C*****TOO MANY POINTS IN KR TABLE, ABORT
ISN 0440           PRINT 5980, NP,I
ISN 0441           STOP
ISN 0442      5980 FORMAT(1H1,'8. ',I5,' POINTS IN KR TABLE',I3,' (MAX IS 15)')
             C*****SET CHUG TO 1,16,31,...
ISN 0443      5055 K = K+15
ISN 0444           CHUG(I) = K
ISN 0445           ICH = CHUG(I)-1
             C     LDP = LINEAR DEFLECTION POINT
             C        NPQ.EQ.5,6,7,8,OR 9 COMPUTE KR'S
             C        NPQ.EQ.10 INPUT KR'S
             C        NPQ.LT.5 ERROR
ISN 0446           IF(NP.GE.10) GO TO 5082
ISN 0448           KR(ICH+1) = 1.
ISN 0449           KR(ICH+2) = 1.
ISN 0450           KR(ICH+5) = 0.
ISN 0451           KR(ICH+6) = 0.
ISN 0452           KR(ICH+7) = 0.
ISN 0453           KR(ICH+8) = 0.
ISN 0454           XKR(ICH+1) = 0.
ISN 0465           XKR(ICH+2) = LDP(I)
ISN 0456           XKR(ICH+3) = 1.001*LDP(I)
ISN 0457           XKR(ICH+6) = 10.*LDP(I)
ISN 0458           GO TO (5087,5087,5087,5087,5083,5084,5085,5086,5091,5082),NP
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ISN 0459      5087 PRINT 5088,NP                                            00006240
ISN 0460      5088 FORMAT(1X // '9. NUMBER OF LINEAR DEFLECTION POINTS NOT',00006250
                 *        ' ACCEPTABLE VALUE = ',I2)                        00006260
ISN 0461           STOP                                                     00006270
ISN 0462      5083 KR(ICH+3) = 0.                                           00006280
ISN 0463           KR(ICH+4) = 0.                                           00006290
ISN 0464           XKR(ICH+4) = 10.*LDP(I)                                  00006300
ISN 0465           XKR(ICH+5) = 20.*LDP(I)                                  00006310
ISN 0466           GO TO 5082                                               00006320
ISN 0467      5084 KR(ICH+3) = -.25                                         00006330
ISN 0468           KR(ICH+4) = -.25                                         00006340
ISN 0469           XKR(ICH+4) =  4.*LDP(I)                                  00006350
ISN 0470           XKR(ICH+5) = 4.001*LDP(I)                                00006360
ISN 0471           GO TO 5082                                               00006370
ISN 0472      5085 KR(ICH+3) = -.5                                          00006380
ISN 0473           KR(ICH+4) = -.5                                          00006390
ISN 0474           XKR(ICH+4) =  3.*LDP(I)                                  00006400
ISN 0475           XKR(ICH+5) = 3.001*LDP(I)                                00006410
ISN 0476           XKR(ICH+7) = 20.*LDP(I)                                  00006420
ISN 0477           GO TO 5082                                               00006430
ISN 0478      5086 KR(ICH+3) = -1.                                          00006440
ISN 0479           KR(ICH+4) = -1.                                          00006450
ISN 0480           XKR(ICH+4) =  2.*LDP(I)                                  00006460
ISN 0481           XKR(ICH+5) = 2.001*LDP(I)                                00006470
ISN 0482           XKR(ICH+7) = 15.*LDP(I)                                  00006480
ISN 0483           XKR(ICH+8) = 20.*LDP(I)                                  00006490
ISN 0484           GO TO 5082                                               00006500
ISN 0485      5091 KR(ICH+3) = -1.                                          00006510
ISN 0486           KR(ICH+4) = -1.                                          00006520
ISN 0487           KR(ICH+7) =  1.                                          00006530
ISN 0488           KR(ICH+8) =  1.                                          00006540
ISN 0489           KR(ICH+9) =  1.                                          00006550
ISN 0490           XKR(ICH+4) = 2.*LDP(I)                                   00006560
ISN 0491           XKR(ICH+5) = 2.001*LDP(I)                                00006570
ISN 0492           XKR(ICH+6) = LDP1(I)                                     00006580
ISN 0493           XKR(ICH+7) = 1.001*LDP1(I)                               00006590
ISN 0494           XKR(ICH+8) = 20.*LDP1(I)                                 00006600
ISN 0495           XKR(ICH+9) = 30.*LDP1(I)                                 00006610
ISN 0496           GO TO 5082                                               00006620
              C                                                             00006630
              C    CARDS 0800                                               00006640
              C                                                             00006650
ISN 0497      5082 PRINT 5960,IQ(I),JQ(I),MQ(I),NQ(I),LQ(I)                 00006660
ISN 0498      5960 FORMAT(1H0,'KR TABLE FOR I,J,M,N,L =',5I5)               00006670
ISN 0499           PRINT5970, (J,XKR(ICH+J),KR(ICH+J),J=1,NP)               00006680
ISN 0500      5970 FORMAT(1H ,I3,1P2E15.5)                                  00006690
              C*****COMPUTE SLOPES AND INTERCEPTS                           00006700
ISN 0501           NPM1 = NP-1                                              00006710
ISN 0502           DO 5080 J = 1,NPM1                                       00006720
ISN 0503           SLOPE = (KR(ICH+J)-KR(ICH+J+1))/(XKR(ICH+J)-XKR(ICH+J+1))00006730
ISN 0504           XKS(ICH+J) = SLOPE                                       00006740
ISN 0505      5080 XKI(ICH+J) = KR(ICH+J)-SLOPE*XKR(ICH+J)                  00006750
              C*****MOVE ENDPOINTS 'WAY OUT                                 00006760
```

```
ISN 0506          XKR(ICH+1) = -1.E35                                          00006770
ISN 0507          XKR(ICH+NP) = 1.E35                                          00006780
ISN 0508     5070 CONTINUE                                                     00006790
            C                                                                  00006800
            C     CARDS 1000 DELETED  6/4/77                                   00006810
            C                                                                  00006820
            C     CARD 1100                                                    00006830
            C                                                                  00006840
ISN 0509     5540 IF(MVP.EQ.0) GO TO 5065                                      00006850
ISN 0511          PRINT 4016                                                   00006860
ISN 0512     4016 FORMAT(//,1X,'VOLUME PENETRATION DATA',/)                    00006870
ISN 0513          PRINT 5538,MVP                                               00006880
ISN 0514     5538 FORMAT(1X,'MASS USED TO IDENTIFY CONTROL VOLUME = ',I3)      00006890
ISN 0515          PRINT 4017                                                   00006900
ISN 0516     4017 FORMAT(1X,'DISTANCE FROM MASS MEASURED ALONG POSITIVE (P) AND NEGA00006910
                 1TIVE (N) AXES')                                              00006920
ISN 0517          PRINT 5530                                                   00006930
ISN 0518     5530 FORMAT(7X,'XN',14X,'XP',14X,'YN',14X,'YP',14X,'ZN',14X,'ZP') 00006940
ISN 0519          PRINT 5522, XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR              00006950
ISN 0520     5522 FORMAT(1X,1P6E15.5)                                          00006960
            C                                                                  00006970
            C     CARDS 1101 AND UP                                            00006980
            C                                                                  00006990
ISN 0521     5065 IF(NDRI.EQ.0) GO TO 5056                                     00007000
ISN 0523          PRINT 5531                                                   00007010
ISN 0524     5531 FORMAT(//1X,'DRI ELEMENTS',//,2X,'I',2X,'J')                 00007020
ISN 0525          JDRI = 2*NDRI                                                00007030
ISN 0526          PRINT 5532,(IJPRT(J),J=1,JDRI)                               00007040
ISN 0527     5532 FORMAT(2I3)                                                  00007050
            C                                                                  00007060
            C     CARDS 1200                                                   00007070
            C                                                                  00007080
ISN 0528     5056 IF(NVCH.EQ.0) GO TO 6000                                     00007090
ISN 0530          PRINT 5601                                                   00007100
ISN 0531     5601 FORMAT(//,1X,'VOLUME CHANGE DATA',/)                         00007110
ISN 0532          FLIPP = 0.                                                   00007120
ISN 0533          DO 5620 I=1,NVCH                                             00007130
ISN 0534          PRINT 5607                                                   00007140
ISN 0535     5607 FORMAT(9X,'MASS',/,1X,'POINT',2X,'NUMBER',14X,               00007150
                 1 'MASS COORDINATES',/,11X,'I',8X,3HX'',12X,3HY'',12X,3HZ'') 00007160
ISN 0536          DO 5621 K=1,8                                                00007170
ISN 0537          J = INBUFF(I,K)                                              00007180
ISN 0538          IF(J.NE.0) GO TO 5623                                        00007190
ISN 0540          J = INBUFF(I,K-1)                                            00007200
ISN 0541          YDP(J) = -YDP(J)                                             00007210
ISN 0542          FLIPP = 1.                                                   00007220
ISN 0543     5623 XP(K) = XDP(J)                                               00007230
ISN 0544          YP(K) = YDP(J)                                               00007240
ISN 0545          ZP(K) = ZDP(J)                                               00007250
ISN 0546          IF(FLIPP.NE.1.) GO TO 5621                                   00007260
ISN 0548          YDP(J) = -YDP(J)                                             00007270
ISN 0549          FLIPP = 0.                                                   00007280
ISN 0550     5621 PRINT 5622,K,J,XP(K),YP(K),ZP(K)                             00007290
```

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ISN 0551      5622 FORMAT(1X,I3,I8,1P3E15.5)
ISN 0552           AVG1     = (XP(1)+XP(2)+XP(5)+XP(6))*.25
ISN 0553           AVG2     = (XP(3)+XP(4)+XP(7)+XP(8))*.25
ISN 0554           DLX = -AVG1+AVG2
ISN 0555           AVG2 = (YP(2)+YP(4)+YP(6)+YP(8))*.25
ISN 0556           AVG1 = (YP(1)+YP(5)+YP(3)+YP(7))*.25
ISN 0557           DLY =  AVG1-AVG2
ISN 0558           AVG1     = (ZP(1)+ZP(2)+ZP(3)+ZP(4))*.25
ISN 0559           AVG2     = (ZP(5)+ZP(6)+ZP(7)+ZP(8))*.25
ISN 0560           DLZ = AVG1-AVG2
ISN 0561           PRINT 5604
ISN 0562      5604 FORMAT(//,16X,'VOLUME SIDE LENGTHS',13X,'INITIAL VOLUME',//,
                  1 8X,'DELX',11X,'DELY',11X,'DELZ',11X,'VZERO')
ISN 0563           VZERO(I) = DLX*DLY*DLZ
ISN 0564           PRINT 5605,DLX,DLY,DLZ,VZERO(I)
ISN 0565      5605 FORMAT(1X,1P4E15.5,//)
ISN 0566           VOLENZ(I,1) = DLX
ISN 0567           VOLENZ(I,2) = DLY
ISN 0568           VOLENZ(I,3) = DLZ
ISN 0569      5620 CONTINUE
             C
             C     CARDS 1300
             C
ISN 0570      6000 IF(NVBM.EQ.0) GO TO 5178
ISN 0572           PRINT 5525
ISN 0573      5525 FORMAT(/ ,1X,'NON-STANDARD MAXIMUM DEFLECTIONS',/,
                  1 36X,'MAXIMUM DEFLECTIONS',/,4X,'BEAM',31X,'VMAX(I,J,L) L=',/,
                  2 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                  3 5X,'1',11X,'2',11X,'3',11X,'4',
                  4 11X,'5',11X,'6',/)
ISN 0574           DO 5170 JI=1,NVBM
ISN 0575           I = IG(IJVM(JI))
ISN 0576           J = JG(IJVM(JI))
ISN 0577           M = MG(IJVM(JI))
ISN 0578           N = NG(IJVM(JI))
ISN 0579           DO 5171 IJ=1,NB
ISN 0580           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.
                  1   M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5172
ISN 0582      5171 CONTINUE
ISN 0583      5172 PRINT 5190,IJ,I,J,M,N,(VMAX2(L,IJ),L=1,6)
ISN 0584      5190 FORMAT(1X,5I3,1P6E12.4)
ISN 0585      5170 CONTINUE
ISN 0586      5178 IF(NVBMN.EQ.0) GO TO 5191
ISN 0588           PRINT 5536
ISN 0589      5536 FORMAT(/1X,'NON-STANDARD MAXIMUM NEGATIVE DEFLECTION',/,
                  1 36X,'MAXIMUM DEFLECTIONS',/,4X,'BEAM',31X,'VMAXN(I,J,L) L=',/,
                  2 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                  3 5X,'1',11X,'2',11X,'3',11X,'4',11X,'5',11X,'6'/)
ISN 0590           DO 5192 JI=1,NVBMN
ISN 0591           I=IG(IJVMN(JI))
ISN 0592           J=JG(IJVMN(JI))
ISN 0593           M=MG(IJVMN(JI))
ISN 0594           N=NG(IJVMN(JI))
```

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ISN 0595          DO 5193 IJ=1,NB                                         00007830
ISN 0596          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.                     00007840
                 1 M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5194                00007850
ISN 0598    5193 CONTINUE                                                 00007860
ISN 0599    5194 PRINT 5190,IJ,I,J,M,N,(VMAX3(L,IJ),L=1,6)               00007870
ISN 0600    5192 CONTINUE                                                 00007880
ISN 0601    5191 IF(NFBM.EQ.0) GO TO 5199                                 00007890
ISN 0603          PRINT 5526                                              00007900
ISN 0604    5526 FORMAT(/,1X,'NON-STANDARD MAXIMUM FORCES',/,36X,'MAXIMUM', 00007910
                 16X,'FORCES',/,4X,'BEAM',31X,'FMAX(I,J,L) L=',/           00007920
                 22X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'1',11X,'2',11X,'3', 00007930
                 311X,'4',11X,'5',11X,'6',/)                              00007940
ISN 0605          DO 5180 JI=1,NFBM                                       00007950
ISN 0606          I = IG(IJFM(JI))                                        00007960
ISN 0607          J = JG(IJFM(JI))                                        00007970
ISN 0608          M = MG(IJFM(JI))                                        00007980
ISN 0609          N = NG(IJFM(JI))                                        00007990
ISN 0610          DO 5181 IJ=1,NB                                         00008000
ISN 0611          IF (I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.               00008010
                 1MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5182                      00008020
ISN 0613    5181 CONTINUE                                                 00008030
ISN 0614    5182 PRINT 5190,IJ,I,J,M,N,(FMAX2(L,IJ),L=1,6)               00008040
ISN 0615    5180 CONTINUE                                                 00008050
ISN 0616    5199 IF(NFBMN.EQ.0) GO TO 6001                                00008060
ISN 0618          PRINT 5537                                              00008070
ISN 0619    5537 FORMAT(/,1X,'NON-STANDARD MAXIMUM NEGATIVE FORCES',/,    00008080
                 1 36X,'MAXIMUM',6X,'FORCES',/,4X,'BEAM',31X,'FMAXN(I,J,L) L=',/ 00008090
                 2 ,2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'1',11X,'2',11X,'3', 00008100
                 3 11X,'4',11X,'5',11X,'6',/)                             00008110
ISN 0620          DO 5195 JI=1,NFBMN                                      00008120
ISN 0621          I=IG(IJFMN(JI))                                         00008130
ISN 0622          J=JG(IJFMN(JI))                                         00008140
ISN 0623          M=MG(IJFMN(JI))                                         00008150
ISN 0624          N=NG(IJFMN(JI))                                         00008160
ISN 0625          DO 5197 IJ=1,NB                                         00008170
ISN 0626          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.     00008180
                 1 N.EQ.NG(IJ)) GO TO 5196                                00008190
ISN 0628    5197 CONTINUE                                                 00008200
ISN 0629    5196 PRINT 5190,IJ,I,J,M,N,(FMAX3(L,IJ),L=1,6)               00008210
ISN 0630    5195 CONTINUE                                                 00008220
           C                                                              00008230
           C      CARDS 1400                                              00008240
           C                                                              00008250
ISN 0631    6001 IF(NHI.EQ.0) GO TO 6002                                  00008260
ISN 0633          PRINT 4006                                              00008270
ISN 0634    4006 FORMAT(//,1X,'MASSES HAVING NONZERO ANGULAR MOMENTA (HE),',/, 00008280
                 1 1X,'CROSS PRODUCTS OF INERTIA (IXY,IYZ,IXZ)',/,        00008290
                 2 1X,'OR LIFT CONSTANTS (LC)',/)                         00008300
ISN 0635          PRINT 5512                                              00008310
ISN 0636    5512 FORMAT(5X,'I',6X,'LC',10X,'HEX',9X,'HEY',9X,'HEZ',9X,'IXY',9X, 00008320
                 1 'IYZ',9X,'IXZ')                                        00008330
ISN 0637          DO 5120 I = 1,NHI                                       00008340
ISN 0638          PRINT 5508,INBUF(I),ALIFT(INBUF(I)),HEX(INBUF(I)),HEY(INBUF(I)), 00008350
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                 1HEZ(INBUF(I)),XYI(INBUF(I)),YZI(INBUF(I)),XZI(INBUF(I))
ISN 0639    5508 FORMAT(1X,I5,1P7E12.4)
ISN 0640    5120 CONTINUE
           C
           C     CARDS 1500
           C
ISN 0641    6002 IF(NPH.EQ.0) GO TO 6003
ISN 0643         DO 5550 J=1,NPH
ISN 0644         PRINT 5570
ISN 0645    5570 FORMAT(1X,'NONZERO PHIDP,THEDP,PSIDP',/,9X,'I',3X,'PHIDP',10X,
                1 'THEDP',10X,'PSIDP')
ISN 0646         I = IPHDP(J)
ISN 0647         PRINT 5555,I,PHIDP(I),THEDP(I),PSIDP(I)
ISN 0648    5555 FORMAT(1X,I10,1P3E15.5)
ISN 0649    5550 CONTINUE
           C
           C     CARDS 1600
           C
ISN 0650         PRINT 5571
ISN 0651    5571 FORMAT(1X,'BEAM EULER ANGLES',/,1X,'IJ',2X,'I',2X,'J',3X,
                1 'PHIIJ',10X,'THEIJ',10X,'PSIIJ')
ISN 0652         DO 5552 J=1,NB
ISN 0653         PRINT 5557,J,IG(J),JG(J),PHIIJ(J),THEIJ(J),PSIIJ(J)
ISN 0654    5557 FORMAT(3I3,1P3E15.5)
ISN 0655    5552 CONTINUE
           C
           C     CARDS 1700,1800
           C
ISN 0656    6003 IF(NACC.EQ.0) GO TO 6005
ISN 0658         PRINT 7001
ISN 0659    7001 FORMAT(//,1X,'ACCELERATION INPUT TABLE DATA')
ISN 0660         PRINT 7006
ISN 0661    7006 FORMAT(/,1X,'MASS LOCATION   DIRECTION   NO. PTS.')
ISN 0662         DO 7010 I=1,NACC
ISN 0663         PRINT 7009,MASSNO(I),DIR(I),NPTS(I)
ISN 0664    7009 FORMAT(6X,I2,12X,I2,9X,I2)
ISN 0665    7010 CONTINUE
ISN 0666         PRINT 7007
ISN 0667    7007 FORMAT(/,1X,'PT',7X,'TIME',11X,'ACCEL')
ISN 0668         L=0
ISN 0669         DO 7002 I=1,NACC
ISN 0670         K=NPTS(I)
ISN 0671         DO 7002 J=1,K
ISN 0672         L=L+1
ISN 0673         PRINT 7008,L,TIM(L),ACCEL(L)
ISN 0674    7008 FORMAT(1X,I2,2(5X,1PE10.3))
ISN 0675    7002 CONTINUE
           C
           C     CARDS 2100
           C
ISN 0676    6005 PRINT 5524
ISN 0677    5524 FORMAT(///,1X,'I,J,M,N',/,1X,'K-MATRIX FOR INTERNAL BEAM IJ')
ISN 0678         DO 5528 IJ=1,NB
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ISN 0679          PRINT 5529,IG(IJ),JG(IJ),MG(IJ),NG(IJ)                 00008890
ISN 0680     5529 FORMAT(1X,4I3)                                         00008900
ISN 0681          PRINT 5533,((XK3(L,K,IJ),L=1,6),K=1,6)                 00008910
ISN 0682     5533 FORMAT(1X,1P6E15.5)                                    00008920
ISN 0683     5528 CONTINUE                                               00008930
ISN 0684          RETURN                                                 00008940
ISN 0685          END                                                    00008950
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      *                                                                                        *
      *                                                                                        *
      *               LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.             *
      *                                                                                        *
      ******************************************************************************************

        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                      SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C          DATA SET D2334IPUT  AT LEVEL 012 AS OF 06/25/79
            C          DATA SET D2332VIU   AT LEVEL 001 AS OF 01/17/78          00000010
            C          DATA SET D2332NIU   AT LEVEL 002 AS OF 11/09/77          00000020
            C          DATA SET D2332NIU   AT LEVEL 001 AS OF 11/02/77          00000030
            C          DATA SET D2332VINPU AT LEVEL 004 AS OF 10/04/77          00000040
            C          DATA SET D2332QIU   AT LEVEL 001 AS OF 07/26/77          00000050
ISN 0002          SUBROUTINE INPUT                                              00000060
            C                                                                   00000070
ISN 0003          IMPLICIT REAL*8 (A-H,O-Z)                                     00000080
ISN 0004          REAL*8 KUN,CASEIN,CASOUT,MINDT                                00000090
ISN 0005          REAL*8 LBAR,MU,KE                                             00000100
ISN 0006          REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)          00000110
ISN 0007          INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150),PTEMP(4)          00000120
ISN 0008          INTEGER*4 TITLE(40),BLANK,STOP,RUNIN,RUNOUT                   00000130
ISN 0009          INTEGER*4 DIR                                                 00000140
ISN 0010          INTEGER*2 CHUG,INBUFF,II(40),KK(40),INBUF(80)                 00000150
ISN 0011          INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)           00000160
ISN 0012          INTEGER*2 MQ(180),NQ(180)                                     00000170
ISN 0013          INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR        00000180
ISN 0014          INTEGER*2 N1,NN,IBS,IG,JG                                     00000190
ISN 0015          INTEGER*2 NTOL1,NTOL2,NTOL3                                   00000200
ISN 0016          INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE             00000210
ISN 0017          INTEGER*2 IJSAVE(180)                                         00000220
ISN 0018          INTEGER*2 NKMVEC(150)                                         00000230
ISN 0019          INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)              00000240
ISN 0020          INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,            00000250
                 *         JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),      00000260
                 *         JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),           00000270
                 *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT       00000280
ISN 0021          DIMENSION G(150),VMAX2(6,150),FMAX2(6,150)                    00000290
ISN 0022          DIMENSION FMAX3(6,150),VMAX3(6,150),PTEMPM(4)                 00000300
ISN 0023          DIMENSION XK3(6,6,150)                                        00000310
ISN 0024          DIMENSION IJPRT(14),VMAXT(6),FMAXT(6)                         00000320
ISN 0025          DIMENSION MASSNO(50),DIR(50),NPTS(50)                         00000330
ISN 0026          DIMENSION IPHDP(80)                                           00000340
ISN 0027          DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)                       00000350
ISN 0028          COMMON/IBALL/ IBUF1(20)                                       00000360
ISN 0029          COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10), 00000370
                 *              NMPTS(10),MNUM(50,10),ISCALE(10)                00000380
ISN 0030          COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3), 00000390
                 1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000400
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                 2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),  00000410
                 3 MVP                                                              00000420
ISN 0031           COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),          00000430
                 1 XLB(150),ZI(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),    00000440
                 2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                     00000450
ISN 0032           COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),      00000460
                 1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)          00000470
ISN 0033           COMMON/DOIN/ CBAR(150)                                           00000480
ISN 0034           COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT      00000490
ISN 0035           COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),        00000500
                 1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT           00000510
ISN 0036           COMMON/INDEAC/ NACC                                              00000520
ISN 0037           COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                00000530
                 1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,               00000540
                 2 XGDOT,YGDOT,ZGDOT                                                00000550
ISN 0038           COMMON/INIDCP/ YDP(80)                                           00000560
ISN 0039           COMMON/INPR/  NDRI,NSP                                           00000570
ISN 0040           COMMON/INCFIC/ BETA                                              00000580
ISN 0041           COMMON/MACFIN/ TMAX,IPRINT                                       00000590
ISN 0042           COMMON/MCFIII/ SYMFLG                                            00000600
ISN 0043           COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                               00000610
ISN 0044           COMMON/NP00I2/ MG,NG,INP,MNP                                     00000620
ISN 0045           COMMON/NP01I2/ II,KK,MM                                          00000630
ISN 0046           COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN                       00000640
ISN 0047           COMMON/NP00I4/ NNP                                               00000650
ISN 0048           COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                 00000660
ISN 0049           COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),       00000670
                 1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),   00000680
                 2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO         00000690
ISN 0050           COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000700
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),            00000710
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),           00000720
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),    00000730
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),  00000740
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,  00000750
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                             00000760
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,             00000770
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),           00000780
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),         00000790
                 A CEIKF(40),                                                       00000800
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                            00000810
                 C NM,NB,I,J,IG(150),JG(150),                                       00000820
                 D N1(900),NN(40),IJPR(150)                                         00000830
ISN 0051           COMMON/IPIC/ NIC                                                 00000840
ISN 0052           COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP                  00000850
ISN 0053           COMMON/UB/ DB(150),IJUB(150),NUB                                 00000860
ISN 0054           COMMON/COMMR8/ G                                                 00000870
ISN 0055           COMMON/COMMR4/ KR     ,LDP    ,LDP1                              00000880
ISN 0056           COMMON/COMMI4/ ND,NVBMN,NFBMN,NHI,NKM,NLB,                       00000890
                 1                NPH    ,NMTL   ,NPTS   ,NVBM   ,IJPRT  ,IPHDP,NFBM  00000900
ISN 0057           COMMON/COMMI2/ IQ             ,JQ             ,LQ     ,NPQ    ,INBUF , 00000910
                 1                NKMVEC,IJSAVE                                     00000920
ISN 0058           COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3                             00000930
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ISN 0059          COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,             00000940
                 *              JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,          00000950
                 *              NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT      00000960
ISN 0060          COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)        00000970
ISN 0061          COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR      00000980
ISN 0062          EQUIVALENCE (XK(1),XK3(1,1,1))                                     00000990
ISN 0063          EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))                  00001000
ISN 0064          EQUIVALENCE (VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))                00001010
ISN 0065          EQUIVALENCE (MASSNO(1),INDEX(1,1))                                 00001020
ISN 0066          EQUIVALENCE (DIR(1),INDEX(1,2))                                    00001030
ISN 0067          DATA STOP/'END '/                                                  00001040
ISN 0068          DATA BLANK/'    '/                                                 00001050
ISN 0069          SQRT(X) = DSQRT(X)                                                 00001060
ISN 0070          ABS(X) = DABS(X)                                                   00001070
            C                                                                        00001080
            C     INITIALIZATION                                                     00001090
            C                                                                        00001100
ISN 0071          DO 1 I=1,150                                                       00001110
ISN 0072          NKMVEC(I) = 0                                                      00001120
ISN 0073          SF26(I)=0.                                                         00001130
ISN 0074          SF35(I)=0.                                                         00001140
ISN 0075          SF26J(I)=0.                                                        00001150
ISN 0076          SF35J(I)=0.                                                        00001160
ISN 0077        1 CONTINUE                                                           00001170
ISN 0078          DO 5130 I = 1,MAXNM                                                00001180
ISN 0079          ALIFT(I) = 0.0                                                     00001190
ISN 0080          HEX(I) = 0.0                                                       00001200
ISN 0081          HEY(I) = 0.0                                                       00001210
ISN 0082          HEZ(I) = 0.0                                                       00001220
ISN 0083          XYI(I) = 0.0                                                       00001230
ISN 0084          YZI(I) = 0.0                                                       00001240
ISN 0085          XZI(I) = 0.0                                                       00001250
ISN 0086          PHIDP(I) = 0.0                                                     00001260
ISN 0087          THEDP(I) = 0.0                                                     00001270
ISN 0088          PSIDP(I) = 0.0                                                     00001280
ISN 0089     5130 CONTINUE                                                           00001290
ISN 0090          MXIGS6 = 6*MAXIGS                                                  00001300
ISN 0091          DO 5010 I = 1,MXIGS6                                               00001310
ISN 0092     5010 NLSFLG(I) = 0                                                      00001320
            C                                                                        00001330
            C     CARD 0001,0002                                                     00001340
            C                                                                        00001350
ISN 0093          READ 5100,(TITLE(I),I=1,20)                                        00001360
ISN 0094     5100 FORMAT(20A4)                                                       00001370
ISN 0095          IF(TITLE(1).EQ.STOP) RETURN                                        00001380
ISN 0097          READ 5100,(TITLE(I),I=21,40)                                       00001390
ISN 0098          TITLE(19) = BLANK                                                  00001400
ISN 0099          TITLE(20) = BLANK                                                  00001410
ISN 0100          TITLE(39) = BLANK                                                  00001420
ISN 0101          TITLE(40) = BLANK                                                  00001430
            C                                                                        00001440
            C     CARD 0003                                                          00001450
            C                                                                        00001460
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ISN 0102          READ 5100,DUMMY
               C
               C     CARD 0004
               C
ISN 0103          READ 5200,NM,NSP,NB,NLB,NNP,NPIN,NUB,NDRI,NDLEO,NACC,MVP,NVCH,
                 1 NMTL,ND
ISN 0104          READ 5200,NVBM,NFBM,NVBMN,NFBMN,NKM,NHI,NPH,NTOL1,NTOL2,NTOL3,
                 1 NSC,NIC
ISN 0105     5200 FORMAT(14I5,2I1)
               C
               C     NSC EQ.OR LESS 0 THEN NO STRESS CALC.
               C     NIC EQ.OR LESS 0 THEN NO PREL. LOADS/DEFLS IN SUBROUTINE IC
               C
               C     CARDS 0005, 0006
               C
ISN 0106          READ 5203,CASEIN,RUNIN,MSECIN
ISN 0107          READ 5203,CASOUT,RUNOUT,MSCOUT
ISN 0108     5203 FORMAT(A8,2X,6I10)
               C
               C     CARD 0007
               C
ISN 0109          READ 5201,IPRINT,DELTAT,TMAX,PLOWT,FCUT,RUNMOD
ISN 0110          MINDT = 0.1 * DELTAT
ISN 0111          TPRINT = IPRINT * DELTAT
ISN 0112          READ 5201,IVAR,EL,EU,RATMIN,RATMAX
ISN 0113     5201 FORMAT(I10,5E10.0)
               C
               C     CARDS 0008, 0009
               C
ISN 0114          READ 5200,NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP
ISN 0115          IF(NTOL1.NE.0) GO TO 5570
ISN 0117          NTOL1=1
ISN 0118     5570 IF(NTOL2.NE. 0) GO TO 5571
ISN 0120          NTOL2=10
ISN 0121     5571 IF(NTOL3.NE.0) GO TO 5572
ISN 0123          NTOL3=30
               C
               C     NTOL1=ALLOWABLE ENERGY GROWTH TOLERANCE IN PER CENT(%)
               C     NTOL2=ALLOWABLE INDIVIDUAL NEGATIVE ENERGY IN PER CENT(%)
               C     NTOL3=ALLOWABLE MASS DEVIATION TOLERANCE IN PER CENT(%)
               C     NIMP=MASS IMPULSE PRINT 2/1/79
               C
ISN 0124     5572 READ 5200,NMEP,NNEP,NBFP,NBDP,NSTP,NSEP,NENP,NDRP,NPLT,NPFCT
ISN 0125          IPFCT = -1
               C
               C     NSF=STRAIN FORCE,NTF=TOTAL FORCE,NDE=BEAM DEFL.,NSPD=EXT.SPRING
               C     DATA,NED=MASS&BEAM ENERGY PRINT,NS=STRESS PRINT,NRP=
               C     TRANS.ACCEL(UNFILTERED&FILTERED)ONLY
               C     NSF,NTF,NDE,NSPD,NED,NS, EQ. OR LESS THAN 0 NO PRINT
               C     NRP EQ.OR LESS THAN 0 ONLY TRANS.ACCELS PRINT,>0 ALL MASS RESPONSE
               C
               C     NUB=NO.OF UNSYMMETRICAL BEAMS
               C     NMEP,NNEP,NBFP,NBDP,NSTP,NSEP,NDRP ARE  THE HISTORY PLOTS FOR
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              C     MASSPOINTS,NODE POINTS,BEAM FORCES,BEAM DEFLECTIONS,STRESSES,     00002000
              C     EXT.SPRINGS,DRI'S,RESPECTIVELY                                    00002010
              C     NPLT=NO.MASS POSITION PLOTS AT SELECTED INTERVALS                 00002020
              C     NENP=TIME HISTORY PLOT OF STRAIN & DAMPING ENERGY                 00002030
              C                                                                       00002040
ISN 0126            IF(NSC.GT.0) GO TO 5210                                           00002050
ISN 0128            NS=0                                                              00002060
ISN 0129       5210 CONTINUE                                                          00002070
ISN 0130            IF(DELTAT.LE.0.) GO TO 5000                                       00002080
ISN 0132            IF(NM.LE.0) GO TO 5000                                            00002090
              C                                                                       00002100
              C     CARD 0010                                                         00002110
              C                                                                       00002120
ISN 0134            READ 5300,XGDOT,YGDOT,ZGDOT                                       00002130
              C                                                                       00002140
              C     CARD 0011                                                         00002150
              C                                                                       00002160
ISN 0135            READ 5300,PPR,QPR,RPR                                             00002170
              C                                                                       00002180
              C     CARD 0012                                                         00002190
              C                                                                       00002200
ISN 0136            READ 5300,PHIPR,THEPR,PSIPR,XGIN,ZGIN,BETA                        00002210
ISN 0137       5300 FORMAT(6E10.0)                                                    00002220
              C                                                                       00002230
              C     CARDS 0100                                                        00002240
              C                                                                       00002250
ISN 0138            READ 5301,(WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),I=1,NM)  00002260
ISN 0139       5301 FORMAT(7E10.0)                                                    00002270
              C                                                                       00002280
              C     CARDS 0200                                                        00002290
              C                                                                       00002300
ISN 0140            IF(NNP.EQ.0) GO TO 5534                                           00002310
ISN 0142            READ 4001,(MNP(I),INP(I),XNPDP(I),YNPDP(I),ZNPDP(I),I=1,NNP)      00002320
ISN 0143       4001 FORMAT(2I5,3E10.0)                                                00002330
              C                                                                       00002340
              C CLEAR EXTERNAL SPRING FLAGS (AND THE ASSOCIATED DATA ALTHOUGH THIS     00002350
              C SHOULD NOT BE NECESSARY BECAUSE WE ONLY USE IT IF THE FLAG IS 1.       00002360
              C HOWEVER, THEY MUST BE CLEARED FOR THE SEARCH WHICH PRINTS THE INPUT.) 00002370
              C                                                                       00002380
ISN 0144       5534 IF(NSP.EQ.0) GO TO 5535                                           00002390
ISN 0146            DO 5132 IKM=1,NSP                                                 00002400
ISN 0147            XLBAR(IKM) = 0.                                                   00002410
ISN 0148            XMU(IKM) = 0.                                                     00002420
ISN 0149            XKE(IKM) = 0.                                                     00002430
ISN 0150            SI(IKM) = 0.                                                      00002440
ISN 0151            SA(IKM) = 0.                                                      00002450
ISN 0152            SB(IKM) = 0.                                                      00002460
ISN 0153            SF(IKM) = 0.                                                      00002470
ISN 0154            FSPOI(IKM) = 0.                                                   00002480
ISN 0155            FSPOF(IKM) = 0.                                                   00002490
ISN 0156            CDAMP(IKM)=0.                                                     00002500
ISN 0157       5132 CONTINUE                                                          00002510
              C                                                                       00002520
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              C     CARDS 0300                                                     00002530
              C                                                                    00002540
ISN 0158            READ 5810,(MM(J),II(J),KK(J),XLBAR(J),XMU(J),XKE(J),XMAX(J),   00002550
                   1 GFLEX(J),J=1,NSP)                                             00002560
ISN 0159       5810 FORMAT(I2,I3,I5,5E10.0)                                        00002570
              C                                                                    00002580
              C     CARDS 0400                                                     00002590
              C                                                                    00002600
ISN 0160            DO 5160 IKM=1,NSP                                              00002610
ISN 0161            READ 5301,SI(IKM),SA(IKM),SB(IKM),SF(IKM),FSPOI(IKM),FSPOF(IKM), 00002620
                   1 CDAMP(IKM)                                                    00002630
ISN 0162       5160 CONTINUE                                                       00002640
              C     E=MODULUS OF ELASTICITY,A=AREA,G=MODULUS OF RIGIDITY           00002650
              C     XJ=POLAR MOMENT OF INERTIA,YY=MOMENT OF INERTIA ABOUT THE Y AXIS 00002660
              C     ZZ=MOMENT OF INERTIA ABOUT THE Z AXIS,XLB=MEMBER LENGTH        00002670
              C     YY IS USED WITH (3,5) TERMS (Z,THETA)                          00002680
              C     ZZ IS USED WITH (2,6) TERMS (Y,PSI)                            00002690
              C                                                                    00002700
              C     CARDS 0500                                                     00002710
              C                                                                    00002720
ISN 0163       5535 READ 5306,(MG(IJ),IG(IJ),NG(IJ),JG(IJ),AA(IJ),XJ(IJ),YY(IJ),   00002730
                   1 ZZ(IJ),XIQ(IJ),Z1(IJ),Z2(IJ),MC(IJ),IJ=1,NB)                  00002740
ISN 0164       5306 FORMAT(2(I2,I3),5E10.0,2F5.0,I2)                               00002750
ISN 0165            DO 6101 IJ=1,NB                                                00002760
ISN 0166            IF(XJ(IJ).NE.0.0) GO TO 6102                                   00002770
ISN 0168            XJ(IJ)=YY(IJ)+ZZ(IJ)                                           00002780
ISN 0169       6102 PY(IJ) = 0                                                     00002790
ISN 0170            PZ(IJ) = 0                                                     00002800
ISN 0171            PYJ(IJ) = 0                                                    00002810
ISN 0172            PZJ(IJ) = 0                                                    00002820
ISN 0173       6101 CONTINUE                                                       00002830
              C                                                                    00002840
              C     CARDS 0600                                                     00002850
              C                                                                    00002860
ISN 0174            IF(NMTL.EQ.0) GO TO 2                                          00002870
ISN 0176            DO 4 LL=1,NMTL                                                 00002880
ISN 0177            READ 3,K,EE(K),GG(K),STENS(K),SCOMP(K),SHEAR(K)                00002890
ISN 0178            IBUF1(LL) = K                                                  00002900
ISN 0179          4 CONTINUE                                                       00002910
ISN 0180          3 FORMAT(I5,5X,5E10.0)                                           00002920
              C                                                                    00002930
              C     CARDS 0700                                                     00002940
              C                                                                    00002950
ISN 0181          2 IF(NPIN.EQ.0) GO TO 6112                                       00002960
ISN 0183            DO 6120 JI=1,NPIN                                              00002970
ISN 0184            READ 6122,M,I,N,J,(PTEMP(K),K=1,4),(PTEMPM(K),K=1,4)           00002980
ISN 0185       6122 FORMAT(2(I2,I3),4I5,4E10.0)                                    00002990
ISN 0186            DO 6124 IJ=1,NB                                                00003000
ISN 0187            IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) 00003010
                   1 GO TO 6126                                                    00003020
ISN 0189       6124 CONTINUE                                                       00003030
ISN 0190       6126 PY(IJ) = PTEMP(1)                                              00003040
ISN 0191            PZ(IJ) = PTEMP(2)                                              00003050
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ISN 0192          PYJ(IJ) = PTEMP(3)
ISN 0193          PZJ(IJ) = PTEMP(4)
ISN 0194          SF35(IJ)=PTEMPM(1)
ISN 0195          SF26(IJ)=PTEMPM(2)
ISN 0196          SF35J(IJ)=PTEMPM(3)
ISN 0197          SF26J(IJ)=PTEMPM(4)
ISN 0198     6120 CONTINUE
           C
           C      CARDS 0800
           C
ISN 0199     6112 DO 6111 IJ=1,NB
ISN 0200          IJUB(IJ)=0
ISN 0201     6111 DB(IJ)=0.
ISN 0202          IF(NUB.EQ.0) GO TO 6110
ISN 0204          DO 6114 JI=1,NUB
ISN 0205          READ 6116,M,I,N,J,IJTEMP,DBTEMP
ISN 0206     6116 FORMAT(2(I2,I3),I5,E10.0)
ISN 0207          DO 6118 IJ=1,NB
ISN 0208          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))
                 1 GO TO 6119
ISN 0210     6118 CONTINUE
ISN 0211     6119 IJUB(IJ)=IJTEMP
ISN 0212          DB(IJ)=DBTEMP
ISN 0213     6114 CONTINUE
           C
           C      CARD 0900
           C
ISN 0214     6110 IF(NOLEO.EQ.0) GO TO 6210
ISN 0216          READ 5301,ALPHAP
ISN 0217          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),
                 1 EOLEO(IJ),FAO(IJ),FAA(IJ),EXPOLE(IJ),YMAX(IJ),IJ=1,NOLEO)
ISN 0218          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),
                 1 BOLEO(IJ),BROLEO(IJ),XKEXT(IJ),XKCOMP(IJ),FCOUL(IJ),IJ=1,NOLEO)
ISN 0219     6210 READ 5600,DAMPC
ISN 0220     5600 FORMAT(E10.0)
           C
           C       DAMPC=DAMPING COEFF. FOR ALL BEAMS
           C       NO STANDARD DAMPC VALUE AS OF 3/79 VALUE MUST BE INPUT
           C       IF ND.NE.0 SET DESIRED CBAR TO VALUE READ IN
           C
ISN 0221          CDUM=DAMPC
ISN 0222          DO 5549 IJ=1,NB
ISN 0223     5549 CBAR(IJ) = CDUM
           C
           C      CARDS 0901 AND UP
           C
ISN 0224          IF(ND.EQ.0) GO TO 5543
ISN 0226          DO 5544 JI=1,ND
ISN 0227          READ 5547,M,I,N,J,CDUM
ISN 0228     5547 FORMAT(2(I2,I3),E10.0)
ISN 0229          DO 5544 IJ=1,NB
ISN 0230          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))
                 1 CBAR(IJ) = CDUM
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ISN 0232      5544 CONTINUE
             C
             C     CARDS 1000
             C
ISN 0233      5543 IF(NLB.EQ.0) GO TO 5541
ISN 0235           MXTBL1 = MAXTBL+1
ISN 0236           IF(NLB.GT.MXTBL1) GO TO 5921
             C******KR TABLE INPUT
             C IN DERIV, TO SEE IF THERE IS A TABLE FOR A PARTICULAR IJL, WE LOOK
             C AT NLSFLG(IJL) AND IF IT IS NON-ZERO, IT WILL BE THE TABLE NUMBER
             C FOR THAT IJL.  WE STILL USE SLOPES AND INTERCEPTS FOR THE
             C INTERPOLATION BUT WE MUST FIND WHICH INTERVAL IN X WE'RE IN.
             C THIS IS DONE BY KEEPING, FOR EACH TABLE, A POINTER TO THE LOWER X OF
             C THE INTERVAL WE WERE IN AT THE LAST INTEGRATION STEP
             C (INTEGER*2 CHUG(80)) ON THE GROUNDS THAT WE'RE PROBABLY
             C STILL IN THAT INTERVAL.  IF WE'RE NOT IN THAT INTERVAL, WE CHECK
             C ONE BY ONE IN THE APPROPRIATE DIRECTION UNTIL WE FIND THE RIGHT
             C INTERVAL AND WE SAVE THAT IN CHUG AND DO THE INTERPOLATION.
             C X(I) AND X(NPQ) FOR EACH TABLE ARE REPLACED BY VERY LARGE (E35)
             C NEGATIVE AND POSITIVE NUMBERS SO THAT WE NEED NEVER CHECK FOR BEING
             C OUT OF THE TABLE AND ALSO SO WE DON'T EVEN HAVE TO KNOW HOW MANY
             C POINTS IN THE TABLE.  (IF AN ARGUMENT EXCEEDS 1.E35 WE'LL BOMB
             C SOONER OR LATER). THIS ALLOWS VERY RAPID TABLE SEARCH AND
             C INTERPOLATION.
             C*****INPUT KR TABLE SPECS
             C     DO TO NUMBER OF TABLES INPUT
ISN 0238           DO 5090 I = 1,NLB
ISN 0239           READ 5900,MQ(I),IQ(I),NQ(I),JQ(I),LQ(I),NPQ(I),LDP(I),LDP1(I)
ISN 0240      5900 FORMAT(2(I2,I3),2I5,2E10.0)
             C*****HUNT FOR I,J PAIR SO WE CAN STORE NONLINEAR BEAM I IN NLSFLG
ISN 0241           DO 5030 J = 1,NB
ISN 0242           IF(IQ(I).EQ.IG(J).AND.JQ(I).EQ.JG(J).AND.MQ(I).EQ.MG(J)
                  1 .AND.NQ(I).EQ.NG(J)) GO TO 5040
ISN 0244      5030 CONTINUE
             C*****NO SUCH I,J PAIR, ABORT
ISN 0245           PRINT 5910,IQ(I),JQ(I),MQ(I),NQ(I)
ISN 0246           STOP
ISN 0247      5910 FORMAT(1H1,'5. NON-EXISTENT I,J PAIR IN KR TABLE SPECS',4I5)
             C*****FOUND IT
ISN 0248      5040 NLSFLG(6*(J-1)+LQ(I)) = I
ISN 0249           IJSAVE(I) = J
ISN 0250      5090 CONTINUE
ISN 0251           GO TO 5540
             C*****TOO MANY KR TABLES, ABORT
ISN 0252      5921 PRINT 5920
ISN 0253           STOP
ISN 0254      5920 FORMAT(1H1,'6. TOO MANY KR TABLES')
             C
             C     CARDS 1100
             C
ISN 0255      5540 K = -14
ISN 0256           DO 5070 I = 1,NLB
ISN 0257           NP = NPQ(I)
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ISN 0258           K = K+15
ISN 0259           CHUG(I) = K
ISN 0260           ICH = CHUG(I)-1
ISN 0261           IF(NP.LT.10) GO TO 5070
              C
              C    IF NP.GE.10,WE READ KR TABLE DIRECTLY
              C
ISN 0263           READ 5950,(XKR(ICH+J),KR(ICH+J),J=1,NP)
ISN 0264      5950 FORMAT(2E10.0)
ISN 0265      5070 CONTINUE
              C
              C    CARD 1200
              C
ISN 0266      5541 IF(MVP.EQ.0) GO TO 5065
ISN 0268           READ 5300,XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR
              C
              C    CARDS 1201 AND UP
              C
ISN 0269      5065 DO 5580 IJ=1,NB
ISN 0270           IJPR(IJ) = 0
ISN 0271      5580 CONTINUE
ISN 0272           IF(NDRI.EQ.0) GO TO 5056
ISN 0274           FNDRI = NDRI
ISN 0275           LDRI = FNDRI/7.+.9
ISN 0276           DO 5560 JI=1,LDRI
ISN 0277           READ 5561,(IJPRT(J),J=1,14)
ISN 0278      5561 FORMAT(14I5)
ISN 0279           DO 5560 I=1,7
ISN 0280           DO 5560 IJ=1,NB
ISN 0281           IF(IJPRT(2*I-1).EQ.IG(IJ).AND.IJPRT(2*I).EQ.JG(IJ)) IJPR(IJ) = 1
ISN 0283      5560 CONTINUE
              C
              C    CARDS 1210
              C
ISN 0284      5056 IF(NVCH.EQ.0) GO TO 6000
ISN 0286           DO 5611 I=1,NVCH
ISN 0287           READ 5602,(INBUFF(I,J),J=1,8)
ISN 0288      5602 FORMAT(8I5)
ISN 0289      5611 CONTINUE
              C
              C    CARDS 1300, 1400
              C
              C*****STANDARD VMAX = 100
ISN 0290      6000 DO 5180 I = 1,MXIGS6
ISN 0291      5180 VMAX(I) = 100.0
ISN 0292           IF(NVBM.EQ.0) GO TO 5185
ISN 0294           DO 5170 JI=1,NVBM
ISN 0295           READ 5820,M,I,N,J,(VMAXT(K),K=1,6)
ISN 0296      5820 FORMAT(2(I2,I3),6E10.0)
ISN 0297           DO 5171 IJ=1,NB
ISN 0298           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).
                  1 AND.N.EQ.NG(IJ)) GO TO 5172
ISN 0300      5171 CONTINUE
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ISN 0301     5172 IJVM(JI) = IJ
ISN 0302          DO 5173 L=1,6
ISN 0303          VMAX2(L,IJ)=VMAXT(L)
ISN 0304     5173 CONTINUE
ISN 0305     5170 CONTINUE
ISN 0306     5185 DO 5190 I=1,MXIGS6
ISN 0307     5190 VMAXN(I)=100.0
ISN 0308          IF(NVBMN.EQ.0) GO TO 5178
ISN 0310          DO 5186 JI=1,NVBMN
ISN 0311          READ 5820, M,I,N,J,(VMAXT(K),K=1,6)
ISN 0312          DO 5187 IJ=1,NB
ISN 0313          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))
                 1 GO TO 5188
ISN 0315     5187 CONTINUE
ISN 0316     5188 IJVMN(JI)=IJ
ISN 0317          DO 5189 L=1,6
ISN 0318          VMAX3(L,IJ)=VMAXT(L)
ISN 0319     5189 CONTINUE
ISN 0320     5186 CONTINUE
            C     STANDARD FMAX=1.E10
ISN 0321     5178 DO 5177 I=1,MXIGS6
ISN 0322     5177 FMAX(I)=1.E10
ISN 0323          IF(NFBM.EQ.0) GO TO 6100
ISN 0325          DO 5181 JI=1,NFBM
ISN 0326          READ 5820,M,I,N,J,(FMAXT(K),K=1,6)
ISN 0327          DO 5182 IJ=1,NB
ISN 0328          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).
                 1AND.N.EQ.NG(IJ)) GO TO 5183
ISN 0330     5182 CONTINUE
ISN 0331     5183 IJFM(JI) = IJ
ISN 0332          DO 5184 L=1,6
ISN 0333          FMAX2(L,IJ)=FMAXT(L)
ISN 0334     5184 CONTINUE
ISN 0335     5181 CONTINUE
ISN 0336     6100 DO 6201 I=1,MXIGS6
ISN 0337     6201 FMAXN(I)=1.E10
ISN 0338          IF(NFBMN.EQ.0) GO TO 6001
ISN 0340          DO 6202 JI=1,NFBMN
ISN 0341          READ 5820 ,M,I,N,J,(FMAXT(K),K=1,6)
ISN 0342          DO 6103 IJ=1,NB
ISN 0343          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))
                 1 GO TO 6104
ISN 0345     6103 CONTINUE
ISN 0346     6104  IJFMN(JI)=IJ
ISN 0347          DO 6105 L=1,6
ISN 0348          FMAX3(L,IJ)=FMAXT(L)
ISN 0349     6105 CONTINUE
ISN 0350     6202 CONTINUE
            C
            C     CARDS 1500
            C
ISN 0351     6001 IF(NHI.EQ.0) GO TO 6002
ISN 0353          DO 5120 I = 1,NHI
```

```
ISN 0354          READ 5800,INBUF(I),ALIFT(INBUF(I)),HEX(INBUF(I)),HEY(INBUF(I)),    00005180
                 1HEZ(INBUF(I)),XYI(INBUF(I)),YZI(INBUF(I)),XZI(INBUF(I))            00005190
ISN 0355     5800 FORMAT(I5,E5.0,6E10.0)                                             00005200
ISN 0356     5120 CONTINUE                                                           00005210
            C                                                                        00005220
            C     CARDS 1600                                                         00005230
            C                                                                        00005240
ISN 0357     6002 IF(NPH.EQ.0) GO TO 6003                                            00005250
ISN 0359          DO 5550 J=1,NPH                                                    00005260
ISN 0360          READ 5551,IPHDP(J),T1,T2,T3                                        00005270
ISN 0361          I=IPHDP(J)                                                         00005280
ISN 0362          PHIDP(I)=T1                                                        00005290
ISN 0363          THEDP(I)=T2                                                        00005300
ISN 0364          PSIDP(I)=T3                                                        00005310
ISN 0365     5551 FORMAT(I5,5X,3E10.0)                                               00005320
ISN 0366     5550 CONTINUE                                                           00005330
            C                                                                        00005340
            C     CARDS 1700                                                         00005350
            C                                                                        00005360
ISN 0367     6003 IF(NACC.EQ.0) GO TO 6005                                           00005370
ISN 0369          IF(NACC.GT.50) GO TO 7003                                          00005380
ISN 0371          KOUNT = 0                                                          00005390
ISN 0372          DO 7010 I=1,NACC                                                   00005400
ISN 0373          READ 7000,MASSNO(I),DIR(I),NPTS(I)                                 00005410
ISN 0374     7000 FORMAT(3I5)                                                        00005420
ISN 0375          JAY(I,1) = I                                                       00005430
ISN 0376          JAY(I,2) = NPTS(I)                                                 00005440
ISN 0377          KOUNT = KOUNT+NPTS(I)                                              00005450
ISN 0378          IF(KOUNT.GT.300) GO TO 7003                                        00005460
ISN 0380     7010 CONTINUE                                                           00005470
            C                                                                        00005480
            C     CARDS 1800                                                         00005490
            C                                                                        00005500
ISN 0381          L=0                                                                00005510
ISN 0382          DO 7002 I=1,NACC                                                   00005520
ISN 0383          K=NPTS(I)                                                          00005530
ISN 0384          DO 7002 J=1,K                                                      00005540
ISN 0385          L=L+1                                                              00005550
ISN 0386          READ 7004,TIM(L),ACCEL(L)                                          00005560
ISN 0387     7004 FORMAT(2E10.0)                                                     00005570
ISN 0388     7002 CONTINUE                                                           00005580
ISN 0389          GO TO 6005                                                         00005590
ISN 0390     7003 PRINT 7005,NACC,KOUNT                                              00005600
ISN 0391     7005 FORMAT(1X,'7. ERROR IN ACCEL TIME DATA INPUT' / 1X,                00005610
                 *       'NUMACL,KOUNT = ',2I5)                                      00005620
            C                                                                        00005630
            C     CARDS 2000                                                         00005640
            C                                                                        00005650
ISN 0392     6005 IF(NKM.EQ.0) GO TO 5000                                            00005660
ISN 0394          DO 5521 I1=1,NKM                                                   00005670
ISN 0395          READ 5520,M,I,N,J                                                  00005680
ISN 0396     5520 FORMAT(2(I2,I3))                                                   00005690
ISN 0397          DO 5523 I2=1,NB                                                    00005700
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ISN 0398          IF(I.EQ.IG(I2).AND.J.EQ.JG(I2).AND.M.EQ.MG(I2).AND.N.EQ.NG(I2))   00005710
                 1 IJ=I2                                                           00005720
ISN 0400     5523 CONTINUE                                                          00005730
ISN 0401          NKMVEC(IJ) = 1                                                    00005740
ISN 0402          READ 5300,((XK3(L,K,IJ),L=1,6),K=1,6)                             00005750
ISN 0403     5521 CONTINUE                                                          00005760
ISN 0404     5000 CONTINUE                                                          00005770
            C                                                                       00005780
            C     NPLT=NO. OF PLOTS EACH TIME(MAX. OF 10)                           00005790
            C     ITPL =DESCRIBES PLANE 1=XY,2=XZ,3=YZ                              00005800
            C     NMPTS=NO. OF POINTS FOR A PLOT CURRENTLY=NO.MASS POINTS           00005810
            C     MNUM=MASS NUMBERS TO BE PLOTTED                                   00005820
            C                                                                       00005830
ISN 0405          IF(NPLT .EQ. 0) GO TO 100                                         00005840
ISN 0407          DO 200 IP=1,NPLT                                                  00005850
ISN 0408          READ 5400, ITPL(IP),NMPTS(IP),ISCALE(IP),XSCALE(IP),YSCALE(IP)    00005860
ISN 0409          NPT = NMPTS(IP)                                                   00005870
ISN 0410          READ 5410, (MNUM(JP,IP), JP=1, NPT)                               00005880
ISN 0411     5400 FORMAT(3I5,5X,2E10.5)                                             00005890
ISN 0412     5410 FORMAT(14I5)                                                      00005900
ISN 0413      200 CONTINUE                                                          00005910
ISN 0414      100 CONTINUE                                                          00005920
ISN 0415          IF(NMEP .EQ. 0) GO TO 8000                                        00005930
ISN 0417          DO 8010 I=1, NMEP                                                 00005940
ISN 0418          READ 5200, (JMASS(I,J), J=1, 10)                                  00005950
ISN 0419     8010 CONTINUE                                                          00005960
ISN 0420     8000 IF(NNEP .EQ. 0) GO TO 8020                                        00005970
ISN 0422          DO 8030 I=1, NNEP                                                 00005980
ISN 0423          READ 5200, (JNODE(I,J), J=1, 8)                                   00005990
ISN 0424     8030 CONTINUE                                                          00006000
ISN 0425     8020 IF(NBFP .EQ. 0) GO TO 8040                                        00006010
ISN 0427          DO 8050 I=1, NBFP                                                 00006020
ISN 0428          READ 5200, (JBMF(I,J), J=1, 4)                                    00006030
ISN 0429     8050 CONTINUE                                                          00006040
ISN 0430     8040 IF(NBDP .EQ. 0) GO TO 8060                                        00006050
ISN 0432          DO 8070 I=1, NBDP                                                 00006060
ISN 0433          READ 5200, (JBMD(I,J), J=1, 4)                                    00006070
ISN 0434     8070 CONTINUE                                                          00006080
ISN 0435     8060 IF(NSTP .EQ. 0) GO TO 8080                                        00006090
ISN 0437          DO 8090 I=1, NSTP                                                 00006100
ISN 0438          READ 5200, (JBMS(I,J), J=1, 6)                                    00006110
ISN 0439     8090 CONTINUE                                                          00006120
ISN 0440     8080 IF(NSEP .EQ. 0) GO TO 8100                                        00006130
ISN 0442          DO 8110 I=1, NSEP                                                 00006140
ISN 0443          READ 5200, (JSPR(I,J), J=1, 4)                                    00006150
ISN 0444     8110 CONTINUE                                                          00006160
ISN 0445     8100 IF(NENP.EQ.0) GO TO 8101                                          00006170
ISN 0447          DO 8102 I=1,NENP                                                  00006180
ISN 0448          READ 5200,(JENG(I,J),J=1,3)                                       00006190
ISN 0449     8102 CONTINUE                                                          00006200
ISN 0450     8101 IF(NDRP .EQ. 0) GO TO 8120                                        00006210
ISN 0452          DO 8130 I=1, NDRP                                                 00006220
ISN 0453          READ 5200, JDRI(I)                                                00006230
```

```
ISN 0454     8130 CONTINUE                                   00006240
ISN 0455     8120 RETURN                                     00006250
ISN 0456          END                                        00006260
```

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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C          DATA SET D2334ITERP AT LEVEL 003 AS OF 06/25/79
ISN 0002            SUBROUTINE INTERP(IREF,TT,YOUT)                        00000010
ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                              00000020
ISN 0004            COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2)  00000030
ISN 0005            XNUM=ACCEL(IREF+1)-ACCEL(IREF)                         00000040
ISN 0006            XDEN=TIM(IREF+1)-TIM(IREF)                             00000050
ISN 0007            SLOPE=XNUM/XDEN                                        00000060
ISN 0008            YOUT=ACCEL(IREF)+SLOPE*(TT-TIM(IREF))                  00000070
ISN 0009       6400 FORMAT(5E15.6)                                         00000080
ISN 0010            RETURN                                                 00000090
ISN 0011            END                                                    00000100
```

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*                                                                              *
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                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C         DATA SET D2334MAMUL AT LEVEL 001 AS OF 03/24/76
  ISN 0002           SUBROUTINE MATMUL(A,B,C)                                  00000010
  ISN 0003           IMPLICIT REAL*8 (A-H,O-Z)                                 00000020
  ISN 0004           DIMENSION A(3,3),B(3,3),C(3,3)                            00000030
               C A*B TO C                                                      00000040
  ISN 0005           DO 10 I = 1,3                                             00000050
  ISN 0006           DO 10 J = 1,3                                             00000060
  ISN 0007           SUM = 0.0                                                 00000070
  ISN 0008           DO 20 K = 1,3                                             00000080
  ISN 0009        20 SUM = SUM+A(I,K)*B(K,J)                                   00000090
  ISN 0010        10 C(I,J) = SUM                                              00000100
  ISN 0011           RETURN                                                    00000110
  ISN 0012           END                                                       00000120
```

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********************************************************************************
*                                                                              *
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*                                                                              *
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   COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                      SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
             C          DATA SET D2334MAVEC AT LEVEL 001 AS OF 03/24/76
ISN 0002             SUBROUTINE MATVEC(A,V,P,ISW)                          00000010
ISN 0003             IMPLICIT REAL*8 (A-H,O-Z)                              00000020
ISN 0004             DIMENSION A(3,3),V(3),P(3)                             00000030
             C A*V TO P IF ISW = 0, ELSE AT*V TO P                          00000040
ISN 0005             DO 10 I = 1,3                                          00000050
ISN 0006             SUM = 0.0                                              00000060
ISN 0007             DO 20 K = 1,3                                          00000070
ISN 0008             IF(ISW) 40,30,40                                       00000080
ISN 0009          30 SUM = SUM+A(I,K)*V(K)                                  00000090
ISN 0010             GO TO 20                                               00000100
ISN 0011          40 SUM = SUM+A(K,I)*V(K)                                  00000110
ISN 0012          20 CONTINUE                                               00000120
ISN 0013          10 P(I) = SUM                                             00000130
ISN 0014             RETURN                                                 00000140
ISN 0015             END                                                    00000150
```

```
*****************************************************************************************
*                                                                                       *
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*                                                                                       *
*****************************************************************************************

      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C            DATA SET D2334PAPLO AT LEVEL 005 AS OF 07/19/78
   ISN 0002         SUBROUTINE PAPLOT(V,W,XSCALE,YSCALE,MASS,NMPTS,ISCALE)        00000010
   ISN 0003         IMPLICIT REAL*8(A-H,O-Z)                                      00000020
              C                                                                   00000030
   ISN 0004         INTEGER*4 S,G                                                 00000040
   ISN 0005         INTEGER*2 NMPTS,MASS,ISCALE                                   00000050
              C                                                                   00000060
              C     SUBROUTINE TO GENERATE ONLINE PAPER PLOTS                     00000070
              C                                                                   00000080
   ISN 0006         DIMENSION V(1),W(1),S(105),BX(500),G(9),X(101),Y(101),NN(10), 00000090
                   *          MASS(1),XAXIS(11),YAXIS(9),M(101),MN(101,2)         00000100
   ISN 0007         DATA S(1),S(105)/'(4X,',') '/                                 00000110
   ISN 0008         DATA G/'1X,','1H*','1H.','1H-','1H+','INCH','E9.3',',','9X'/  00000120
   ISN 0009         DATA NN/'1H1','1H2','1H3','1H4','1H5','1H6','1H7','1H8','1H9', 00000130
                   *     '1H0'/                                                   00000140
              C                                                                   00000150
   ISN 0010         IAXIS = 10                                                    00000160
              C                                                                   00000170
              C     SET UP SCALE VALUES FOR INDEPENDANT 'X' ARRAY                 00000180
              C                                                                   00000190
   ISN 0011         XMAX = -1.0E10                                                00000200
   ISN 0012         YMAX = -1.0E10                                                00000210
   ISN 0013         XMIN = 1.0E10                                                 00000220
   ISN 0014         YMIN = 1.0E10                                                 00000230
   ISN 0015         DO 10 I=1, NMPTS                                              00000240
   ISN 0016         XMAX = DMAX1(V(I),XMAX)                                       00000250
   ISN 0017         XMIN = DMIN1(V(I),XMIN)                                       00000260
   ISN 0018         YMAX = DMAX1(W(I),YMAX)                                       00000270
   ISN 0019         YMIN = DMIN1(W(I),YMIN)                                       00000280
   ISN 0020         X(I) = V(I)                                                   00000290
   ISN 0021         Y(I) = W(I)                                                   00000300
   ISN 0022         M(I) = MASS(I)                                                00000310
   ISN 0023      10 CONTINUE                                                      00000320
   ISN 0024         IF(ISCALE .EQ. 3) GO TO 50                                    00000330
   ISN 0026         DX = XMAX - XMIN                                              00000340
   ISN 0027         DY = YMAX - YMIN                                              00000350
              C                                                                   00000360
              C     IF ISCALE=1 SELECT SCALES INDEPENDENTLY BASED ON X AND Y      00000370
              C     IF ISCALE=0 SELECT SCALES OF EQUAL MAGNITUDE                  00000380
              C                                                                   00000390
   ISN 0028         IF(ISCALE .EQ. 1) GO TO 118                                   00000400
```

```
ISN 0030          IF(DY .GT. DX) DX = DY
ISN 0032          IF(DX .GT. DY) DY = DX
ISN 0034      118 CONTINUE
ISN 0035          DX = DX / 10.0
ISN 0036          DY = DY / 8.0
            C
ISN 0037          IAX = YMIN / DY
ISN 0038          YAXIS(1) = IAX * DY
ISN 0039          IF(YAXIS(1) .LT. 0.0) YAXIS(1) = YAXIS(1) - DY
ISN 0041          IAX = (YMAX / DY) + 1
ISN 0042          YSCALE = ((IAX * DY) - YAXIS(1)) / 8.0
ISN 0043          IAX = XMIN / DX
ISN 0044          XAXIS(1) = IAX * DX
ISN 0045          IF(XAXIS(1) .LT. 0.0) XAXIS(1) = XAXIS(1) - DX
ISN 0047          IAX = (XMAX / DX) + 1
ISN 0048          XSCALE = ((IAX * DX) - XAXIS(1)) / 10.0
ISN 0049          GO TO 60
ISN 0050       50 CONTINUE
ISN 0051          IAX = YMIN / YSCALE
ISN 0052          YAXIS(1) = IAX * YSCALE
ISN 0053          IF(YAXIS(1) .LT. 0.0) YAXIS(1) = YAXIS(1) - YSCALE
ISN 0055          IAX = XMIN / XSCALE
ISN 0056          XAXIS(1) = IAX * XSCALE
ISN 0057          IF(XAXIS(1) .LT. 0.0) XAXIS(1) = XAXIS(1) - XSCALE
ISN 0059       60 CONTINUE
ISN 0060          DO 90 I=2, 9
ISN 0061          YAXIS(I) = YAXIS(1) + (I - 1) * YSCALE
ISN 0062       90 CONTINUE
ISN 0063          DO 120 I=2, 11
ISN 0064          XAXIS(I) = XAXIS(1) + (I - 1) * XSCALE
ISN 0065      120 CONTINUE
ISN 0066          IF(YMAX .GT. YAXIS(9) .OR. XMAX .GT. XAXIS(11)) WRITE(6,7040)
ISN 0068     7040 FORMAT(2X,'***   WARNING   ***   ONE OR MORE MASS POINTS ARE NOT',
                 *     ' INCLUDED IN THE FOLLOWING PLOT BECAUSE THE COORDINATES',
                 *     ' OF THE POINT(S) ARE' / 24X, 'OUTSIDE THE LIMITS OF THE',
                 *     ' PLOT.')
ISN 0069          X1 = XAXIS(1)
ISN 0070          DX = XAXIS(11) - XAXIS(1)
ISN 0071          DY = YAXIS(9) - YAXIS(1)
            C
            C     REORDER DEPENDENT 'Y' ARRAY IN MONOTONICALLY INCREASING MAGNITUDE
            C
ISN 0072          CALL FSHELL(Y,BX,NMPTS)
            C
            C     REORDER INDEPENDENT 'X' ARRAY IN CORRESPONDENCE WITH PRESENT 'Y'
            C     ARRAY
            C
ISN 0073          CALL SHELLX(X,BX,NMPTS)
            C
ISN 0074          CALL SHELLM(BX,M,NMPTS)
            C
            C     LINE LOCATES HORIZONTAL AXIS
            C
```

```
ISN 0075          YFIRST = YAXIS(1)                                          00000940
ISN 0076          YLAST = YAXIS(9)                                           00000950
            C                                                                00000960
ISN 0077          IF(YLAST .LE. 0.0) WRITE(6,7030)(XAXIS(I), I=1, 11)        00000970
            C                                                                00000980
            C     LOCATE FIRST VERTICAL SCALE MARK                           00000990
            C     MARK LOCATES '-' IN VERTICAL SCALE                         00001000
            C                                                                00001010
ISN 0079          MARK = 0                                                   00001020
ISN 0080          L0 = (-YFIRST * 48.0 / DY) + 1.5                           00001030
ISN 0081          IF(L0 .GT. 49) L0 = 49                                     00001040
ISN 0083          J = 1                                                      00001050
ISN 0084          N = 1                                                      00001060
ISN 0085          NL = 50                                                    00001070
            C                                                                00001080
            C     START LINE LOOP                                            00001090
            C                                                                00001100
ISN 0086      100 CONTINUE                                                   00001110
            C                                                                00001120
            C     IDENTIFY CURRENT PRINT LINE NUMBER                         00001130
            C                                                                00001140
ISN 0087          NL = 50 - N                                                00001150
            C                                                                00001160
            C     SET UP I1 AND I2 FOR NORMAL PRINT LINE                     00001170
            C                                                                00001180
ISN 0088          I1 = 1                                                     00001190
ISN 0089          I2 = 3                                                     00001200
ISN 0090          IF(NL .EQ. 1 .AND. YLAST .GT. 0.0) GO TO 110               00001210
ISN 0092          IF(NL .NE. L0) GO TO 125                                   00001220
            C                                                                00001230
            C     SET UP I1 AND I2 FOR ZERO AXIS PRINT LINE                  00001240
            C                                                                00001250
ISN 0094      110 CONTINUE                                                   00001260
ISN 0095          I1 = 4                                                     00001270
ISN 0096          I2 = 5                                                     00001280
ISN 0097      125 CONTINUE                                                   00001290
ISN 0098          DO 150 I=5, 104                                            00001300
ISN 0099          S(I) = G(I1)                                               00001310
ISN 0100      150 CONTINUE                                                   00001320
ISN 0101          S(2) = G(9)                                                00001330
ISN 0102          S(3) = G(8)                                                00001340
ISN 0103          S(4) = G(I2)                                               00001350
            C                                                                00001360
            C     PUT HORIZONTAL SCALE MARKS IN 'S' ARRAY                    00001370
            C                                                                00001380
ISN 0104          IF(NL .EQ. 1 .AND. YLAST .GT. 0.0) GO TO 115               00001390
ISN 0106          IF(NL .NE. L0) GO TO 160                                   00001400
ISN 0108      115 CONTINUE                                                   00001410
ISN 0109          DO 155 I1=14, 104, 10                                      00001420
ISN 0110      155 S(I1) = G(5)                                               00001430
ISN 0111      160 CONTINUE                                                   00001440
            C                                                                00001450
            C     START DIMINISHING LOOP ON DEPENDENT ARRAY LINE I.D.        00001460
```

```
                C
ISN 0112              KT = 0
ISN 0113              DO 250 I2=J, NMPTS
ISN 0114              JJ = I2
ISN 0115              K = NMPTS - I2 + 1
ISN 0116              IF(Y(K) .GT. YAXIS(9)) GO TO 250
ISN 0118              L = ((Y(K) - YFIRST) * 48.0 / DY) + 1.5
ISN 0119              IF(L - NL) 260,200,250
ISN 0120          200 CONTINUE
                C
                C     CALCULATE LOCATION IN 'S' ARRAY FOR DATA POINT I.D.
                C
ISN 0121              I1 = ((X(K) - X1) * 100.0 / DX) + 4.5
ISN 0122              IF(X(K) .GT. XAXIS(11)) GO TO 250
ISN 0124              S(I1) = G(2)
ISN 0125              KT = KT + 1
ISN 0126              MN(KT,1) = I1
ISN 0127              MN(KT,2) = K
ISN 0128          250 CONTINUE
ISN 0129              J = NMPTS
ISN 0130              GO TO 275
ISN 0131          260 J = JJ
ISN 0132          275 N = N + 1
                C
ISN 0133              IF(KT .EQ. 0) GO TO 190
ISN 0135              DO 140 I=4, 104
ISN 0136              IF(S(I) .NE. G(2)) GO TO 140
ISN 0138              DO 170 II=1, KT
ISN 0139              I1 = MN(II,1)
ISN 0140              K = MN(II,2)
ISN 0141              IF(I .EQ. I1) GO TO 180
ISN 0143          170 CONTINUE
ISN 0144              GO TO 140
ISN 0145          180 CONTINUE
ISN 0146              IF(M(K) .LT. 10) GO TO 20
ISN 0148              IX = M(K) / 10
ISN 0149              IY = M(K) - (IX * 10)
ISN 0150              IF(IY .EQ. 0) IY = 10
ISN 0152              IF(I1 .GE. 103) GO TO 30
ISN 0154              IF(S(I1+1) .EQ. G(2) .OR. S(I1+2) .EQ. G(2)) GO TO 30
ISN 0156              S(I1+1) = NN(IX)
ISN 0157              S(I1+2) = NN(IY)
ISN 0158              GO TO 140
ISN 0159           30 IF(I1 .LE. 5) GO TO 140
ISN 0161              IF(S(I1-1) .EQ. G(2) .OR. S(I1-2) .EQ. G(2)) GO TO 140
ISN 0163              S(I1-1) = NN(IY)
ISN 0164              S(I1-2) = NN(IX)
ISN 0165              GO TO 140
ISN 0166           20 IF(I1 .GE. 104) GO TO 40
ISN 0168              IF(S(I1+1) .EQ. G(2)) GO TO 40
ISN 0170              S(I1+1) = NN(M(K))
ISN 0171              GO TO 140
ISN 0172           40 IF(I1 .LE. 4) GO TO 140
```

```
ISN 0175          IF(S(I1-1) .EQ. G(2)) GO TO 140
ISN 0176          S(I1-1) = NN(M(K))
ISN 0177      140 CONTINUE
ISN 0178      150 CONTINUE
            C
            C     TEST FOR SCALE MARK LOCATION
            C
ISN 0179          IF(MARK .NE. 0) GO TO 350
            C
            C     PLACE VERTICAL SCALE MARK IN 'S' ARRAY
            C
ISN 0181          IF(S(4) .NE. G(2)) S(4) = G(5)
ISN 0183          S(2) = G(7)
            C
ISN 0184          IAXIS = IAXIS - 1
ISN 0185          WRITE(6,5) YAXIS(IAXIS)
            C
            C     RESET MARK INDEX
            C
ISN 0186          MARK = 6
ISN 0187          GO TO 340
ISN 0188      350 CONTINUE
            C
            C     GENERATE ONE LINE OF PLOTTING
            C
ISN 0189          WRITE(6,S)
            C
            C     DECREMENT MARK INDEX
            C
ISN 0190      340 MARK = MARK - 1
            C
            C     TEST FOR LAST LINE TO DETERMINE IF PLOT IS COMPLETED
            C
ISN 0191          IF(NL .GT. 1) GO TO 100
            C
            C     END OF PLOT.  PRINT MAXIMUMS, MINIMUMS, AND SCALES
            C
ISN 0193          IF(YLAST .LE. 0.0) GO TO 130
ISN 0195          PRINT 7030, (XAXIS(I), I=1, 11)
ISN 0196      130 CONTINUE
ISN 0197          RETURN
            C
            C     FORMATS
            C
ISN 0198     7000 FORMAT(1X)
ISN 0199     7030 FORMAT(8X,11(1X,E9.3))
ISN 0200          END
```

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*                                                                                  *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C         DATA SET D2334PLOTT AT LEVEL 001 AS OF 09/14/77
ISN 0002             SUBROUTINE PLOTT(M,NP,X,Y1,Y2,Y3)
               C
               C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
               C                  PLOTT PLOTS UP TO 3 DEPENDENT,CONTINOUS,
               C                  SINGLED VALUED FUNCTIONS (Y1,Y2,Y3) AGAINST
               C                  AN EVEN INCREMENTED INDEPENDENT VARIABLE(X).
               C                  M IS THE NUMBER OF DEPENDENT VARIABLES
               C                  NP IS THE DIMENSION OF THE ARRAYS X,Y1,Y2,Y3
               C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
               C
ISN 0003             DIMENSION X(1),Y1(1),Y2(1),Y3(1),A(100),PP(3),PM(3),PLOT(105)
ISN 0004             DATA BLNK,PRD,STAR,EQ,PLUS/1H ,1H.,1H*,1H=,1H+/
ISN 0005         900 FORMAT(F7.3,1PE13.3,1P2E10.3,5X,85A1)
ISN 0006         901 FORMAT(F7.3,1PE13.3,1PE10.3,5X,95A1)
ISN 0007         902 FORMAT(F7.3,1PE13.3,5X,105A1)
ISN 0008         910 FORMAT(14X,1H*,9X,1H=,9X,1H+,74X,14HSCALE FACTOR =,1PE10.3)
ISN 0009         911 FORMAT(14X,1H*,9X,1H=,84X,14HSCALE FACTOR =,1PE10.3)
ISN 0010         912 FORMAT(14X,1H*,94X,14HSCALE FACTOR =,1PE10.3)
ISN 0011         920 FORMAT(1X,120(1H.),11HI.........I)
ISN 0012             DO 5 I=1,105
ISN 0013           5 PLOT(I)=BLNK
ISN 0014             DO 6 I=1,3
ISN 0015             PP(I)=0.0
ISN 0016           6 PM(I)=0.0
               C
               C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
               C                  MAX. AND MIN.VALUES OF DEPENDENT VARIABLES
               C                             ARE OBTAINED
               C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
               C
ISN 0017             DO 10 I=1,NP
ISN 0018          10 A(I)=Y1(I)
ISN 0019             MSW=1
ISN 0020             GO TO 60
ISN 0021          20 DO 30 I=1,NP
ISN 0022          30 A(I)=Y3(I)
ISN 0023             MSW=2
ISN 0024             GO TO 60
ISN 0025          40 DO 50 I=1,NP
ISN 0026          50 A(I)=Y2(I)
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ISN 0027          MSW=3                                                   00000410
ISN 0028       60 DO 90 I=1,NP                                            00000420
ISN 0029          IF(A(I)-PP(MSW)) 70,75,75                               00000430
ISN 0030       70 IF(A(I)-PM(MSW)) 80,90,90                               00000440
ISN 0031       80 PM(MSW)=A(I)                                            00000450
ISN 0032          GO TO 90                                                00000460
ISN 0033       75 PP(MSW)=A(I)                                            00000470
ISN 0034       90 CONTINUE                                                00000480
              C                                                           00000490
              C   *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-00000500
              C               REFERENCE AND SCALE FACTOR ARE CALCULATED   00000510
              C   *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-00000520
              C                                                           00000530
ISN 0035          IF(MSW-(M-1))20,40,92                                   00000540
ISN 0036       92 CONTINUE                                                00000550
ISN 0037          XM=0.0                                                  00000560
ISN 0038          XMI=PP(1)                                               00000570
ISN 0039          DO 96 I=1,3                                             00000580
ISN 0040          IF(PP(I)-XM) 93,94,94                                   00000590
ISN 0041       94 XM=PP(I)                                                00000600
ISN 0042       93 IF(PM(I)-XMI) 95,95,96                                  00000610
ISN 0043       95 XMI=PM(I)                                               00000620
ISN 0044       96 CONTINUE                                                00000630
ISN 0045          A(2)=PP(2)                                              00000640
ISN 0046          A(3)=PM(2)                                              00000650
ISN 0047          PP(2)=PP(3)                                             00000660
ISN 0048          PM(2)=PM(3)                                             00000670
ISN 0049          PP(3)=A(2)                                              00000680
ISN 0050          PM(3)=A(3)                                              00000690
ISN 0051          NRA=104-(M-1)*10                                        00000700
ISN 0052          RA=NRA                                                  00000710
ISN 0053          SF=(XM-XMI)/RA                                          00000720
ISN 0054          SFT=10.*SF                                              00000730
ISN 0055          IF(SF .EQ. 0.0) SF=1.0                                  00000735
ISN 0057          IF(ABS(XM-XMI).LT.1.E-6)GO TO 97                        00000740
ISN 0059          REF= ABS(XMI/(XM-XMI))*RA+1.5                           00000750
ISN 0060          GO TO 98                                                00000760
ISN 0061       97 REF=1.5                                                 00000770
ISN 0062       98 NR=REF                                                  00000780
ISN 0063          IF(M-2)100,105,110                                      00000790
ISN 0064      100 PRINT 912, SFT                                          00000800
ISN 0065          GO TO 120                                               00000810
ISN 0066      105 PRINT 911, SFT                                          00000820
ISN 0067          GO TO 120                                               00000830
ISN 0068      110 PRINT 910, SFT                                          00000840
ISN 0069      120 PRINT 920                                               00000850
ISN 0070          DO 200 I=1,NP                                           00000860
ISN 0071          PLOT(NR)=PRD                                            00000870
ISN 0072          L=Y1(I)/SF+REF                                          00000880
ISN 0073          PLOT(L)=STAR                                            00000890
ISN 0074          IF(M.EQ.1)GO TO 130                                     00000900
ISN 0076          K=Y2(I)/SF+REF                                          00000910
ISN 0077          PLOT(K)=EQ                                              00000920
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ISN 0078           IF(M.EQ.2)GO TO 140
ISN 0080           J=Y3(I)/SF+REF
ISN 0081           PLOT(J)=PLUS
ISN 0082           GO TO 150
ISN 0083       130 PRINT 902, X(I),Y1(I),(PLOT(J),J=1,105)
ISN 0084           PLOT(L)=BLNK
ISN 0085           GO TO 200
ISN 0086       140 PRINT 901, X(I),Y1(I),Y2(I),(PLOT(J),J=1,95)
ISN 0087           PLOT(L)=BLNK
ISN 0088           PLOT(K)=BLNK
ISN 0089           GO TO 200
ISN 0090       150 PRINT 900, X(I),Y1(I),Y2(I),Y3(I),(PLOT(J),J=1,85)
             C
             C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
             C                PLOT FIELD IS RE-ZEROED
             C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
             C
ISN 0091           DO 160 NO=1,105
ISN 0092       160 PLOT(NO)=BLNK
ISN 0093       200 CONTINUE
ISN 0094           RETURN
ISN 0095           END
```

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*                                                                                         *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C          DATA SET D2334PREPL AT LEVEL 004 AS OF 06/25/79
               C          DATA SET D2332VPP   AT LEVEL 001 AS OF 01/17/78         00000010
               C          DATA SET D2332VPREP AT LEVEL 006 AS OF 10/07/77         00000020
  ISN 0002           SUBROUTINE PREPLT(TPRINT,NM,NNP,NB,NSP,NDRI,MSECIN)          00000030
               C                                                                  00000040
               C     IN SUBROUTINE PREPLT, OUTPUT DATA FROM KRASH ARE SHUFFLED AND 00000050
               C     PROCESSED FOR SUBSEQUENT USE IN SUBROUTINE PLOTT.            00000060
               C                                                                  00000070
  ISN 0003           INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,           00000080
                    *         JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),     00000090
                    *         JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),          00000100
                    *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT      00000110
  ISN 0004           REAL*8 TPRINT,TMAX                                           00000120
               C                                                                  00000130
  ISN 0005           DIMENSION WORK(900)                                          00000140
  ISN 0006           DIMENSION AM(31,27),TM(31),IM(31)                            00000150
  ISN 0007           DIMENSION AN(41,18),TN(41),IN(41),INM(41)                    00000160
  ISN 0008           DIMENSION AB(51,8),TB(51),IBG(51),JBG(51),MBG(51),           00000170
                    *         NBG(51),IB(51)                                      00000180
  ISN 0009           DIMENSION AT(51,10),TT(51),ITG(51),JTG(51),MTG(51),          00000190
                    *         NTG(51),IT(51)                                      00000200
  ISN 0010           DIMENSION AS(41,6),TS(41),ISM(41),ISN(41)                    00000210
  ISN 0011           DIMENSION AE(51,4),TE(51),IEG(51),JEG(51),MEG(51),NEG(51),IE(51) 00000220
  ISN 0012           DIMENSION AD(101),TD(101),IDM(101)                           00000230
  ISN 0013           DIMENSION AV(201,3),TV(201)                                  00000240
               C                                                                  00000250
  ISN 0014           COMMON/MACFIN/ TMAX,IPRINT                                   00000260
  ISN 0015           COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,       00000270
                    *             JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,      00000280
                    *             NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT  00000290
               C                                                                  00000300
  ISN 0016           EQUIVALENCE (WORK(1),AM(1,1)),(WORK(838),TM(1)),             00000310
                    *            (WORK(869),IM(1))                                00000320
  ISN 0017           EQUIVALENCE (WORK(1),AN(1,1)),(WORK(738),TN(1)),             00000330
                    *            (WORK(779),IN(1)),(WORK(820),INM(1))             00000340
  ISN 0018           EQUIVALENCE (WORK(1),AB(1,1)),(WORK(409),TB(1)),             00000350
                    *            (WORK(460),IBG(1)),(WORK(511),JBG(1)),           00000360
                    *            (WORK(562),MBG(1)),(WORK(613),NBG(1)),           00000370
                    *            (WORK(664),IB(1))                                00000380
  ISN 0019           EQUIVALENCE (WORK(1),AT(1,1)),(WORK(511),TT(1)),             00000390
                    *            (WORK(562),ITG(1)),(WORK(613),JTG(1)),           00000400
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                 *              (WORK(664),MTG(1)),(WORK(715),NTG(1)),
                 *              (WORK(766),IT(1))
ISN 0020          EQUIVALENCE (WORK(1),AS(1,1)),(WORK(247),TS(1)),
                 *              (WORK(288),ISM(1)),(WORK(329),ISN(1))
ISN 0021          EQUIVALENCE (WORK(1),AE(1,1)),(WORK(205),TE(1)),
                 *              (WORK(256),IEG(1)),(WORK(307),JEG(1)),
                 *              (WORK(358),MEG(1)),(WORK(409),NEG(1)),
                 *              (WORK(460),IE(1))
ISN 0022          EQUIVALENCE (WORK(1),AD(1)),(WORK(102),TD(1)),
                 *              (WORK(203),IDM(1))
ISN 0023          EQUIVALENCE (WORK(1),AV(1,1)),(WORK(604),TV(1))
             C
ISN 0024          TREST = MSECIN * 0.001
ISN 0025          NDT = ((TMAX - TREST) /  TPRINT ) + 1.00001
             C
             C    PLOT MASS POINT DATA IF REQUESTED
             C
ISN 0026          REWIND 12
ISN 0027          IF(NMEP .LE. 0) GO TO 70
ISN 0029          PRINT 7000, NMEP
ISN 0030     7000 FORMAT (1H1,5X,I5,2X,'MASS PLOT FLAG SUMMARY')
ISN 0031          DO 7010 I=1, NMEP
ISN 0032          PRINT 7020, (JMASS(I,J), J=1, 10)
ISN 0033     7020 FORMAT (10X,10I8)
ISN 0034     7010 CONTINUE
ISN 0035          REWIND 1
ISN 0036          L = 1
ISN 0037          ICNT = 0
ISN 0038          NCNT = 0
ISN 0039          DO 10 I=1, NMEP
ISN 0040          IFIND = 0
ISN 0041          IF(NMEW .EQ. 0) GO TO 15
ISN 0043          DO 20 J=1, NDT
ISN 0044          DO 30 K=1, NMEW
ISN 0045          READ(1) (TM(L),DUMMY,IM(L),(AM(L,M),DUMMY, M=1, 27))
ISN 0046          IF(IM(L) .NE. JMASS(I,1)) GO TO 30
ISN 0048          IFIND = 1
ISN 0049          L = L + 1
ISN 0050          ICNT = ICNT + 1
ISN 0051       30 CONTINUE
ISN 0052       20 CONTINUE
ISN 0053          IF(IFIND .EQ. 1) GO TO 35
ISN 0055       15 PRINT 6023, JMASS(I,1)
ISN 0056     6023 FORMAT(1H1,5X,'18. UNABLE TO FIND DATA FOR MASS',I5,
                 *        '.  PLOTS FOR THIS MASS WILL BE SUPPRESSED.')
ISN 0057       35 IF((ICNT+NDT).LE.30) GO TO 50
ISN 0059          NCNT = 1
ISN 0060          DO 40 K=1, ICNT
ISN 0061          WRITE(12) (TM(K),IM(K),(AM(K,M), M=1, 27))
ISN 0062       40 CONTINUE
ISN 0063          ICNT = 0
ISN 0064          L = 1
ISN 0065       50 CONTINUE
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ISN 0066          REWIND 1
ISN 0067       10 CONTINUE
ISN 0068          IF(ICNT.EQ.30.OR.NCNT.EQ.0) GO TO 65
ISN 0070          DO 60 K=1, ICNT
ISN 0071          WRITE(12) (TM(K),IM(K),(AM(K,M), M=1, 27))
ISN 0072       60 CONTINUE
ISN 0073       65 CONTINUE
ISN 0074          IF(NCNT .NE. 0) REWIND 12
ISN 0076          IFIND = 0
ISN 0077          IC = 0
ISN 0078          DO 85 I=1, NMEP
ISN 0079          IF(IFIND .EQ. 1) GO TO 2010
ISN 0081          IC = IC + 1
ISN 0082          IF(NCNT .EQ. 0) GO TO 2000
ISN 0084          IF(IC .GT. NMEW) GO TO 81
ISN 0086          ICNT = 1
ISN 0087          DO 90 J=1, NDT
ISN 0088          READ(12) (TM(J),IM(J),(AM(J,K), K=1, 27))
ISN 0089       90 CONTINUE
ISN 0090          GO TO 2010
ISN 0091     2000 ICNT = IC * NDT + 1 - NDT
ISN 0092     2010 CONTINUE
ISN 0093          IF(IM(ICNT) .EQ. JMASS(I,1)) GO TO 45
ISN 0095          IFIND = 1
ISN 0096          GO TO 80
ISN 0097       45 IFIND = 0
ISN 0098          IF(JMASS(I,2) .EQ. 0) GO TO 100
ISN 0100          PRINT 6000, IM(ICNT)
ISN 0101     6000 FORMAT(1H1,5X,'MASS ',I3,3X,'DISPLACEMENTS(IN)' //
                *        1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')
ISN 0102          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,1),AM(ICNT,2),AM(ICNT,3))
ISN 0103      100 CONTINUE
ISN 0104          IF(JMASS(I,3) .EQ. 0) GO TO 110
ISN 0106          PRINT 6001, IM(ICNT)
ISN 0107     6001 FORMAT(1H1,5X,'MASS ',I3,3X,'EULER ANGLES(RADIAN)' //
                *        1X,'TIME(SEC)',3X,'PHI',6X,'THETA',6X,'PSI')
ISN 0108          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,16),AM(ICNT,17),AM(ICNT,18))
ISN 0109      110 CONTINUE
ISN 0110          IF(JMASS(I,4) .EQ. 0) GO TO 120
ISN 0112          PRINT 6002, IM(ICNT)
ISN 0113     6002 FORMAT(1H1,5X,'MASS ',I3,3X,'VELOCITY(IN/SEC) - GROUND AXES' //
                *        1X,'TIME(SEC)',2X,'XDOT',6X,'YDOT',6X,'ZDOT')
ISN 0114          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,4),AM(ICNT,5),AM(ICNT,6))
ISN 0115      120 CONTINUE
ISN 0116          IF(JMASS(I,5) .EQ. 0) GO TO 130
ISN 0118          PRINT 6003, IM(ICNT)
ISN 0119     6003 FORMAT(1H1,5X,'MASS ',I3,3X,'VELOCITY(IN/SEC) - MASS AXES' //
                *        1X,'TIME(SEC)',4X,'U',9X,'V',9X,'W')
ISN 0120          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,7),AM(ICNT,8),AM(ICNT,9))
ISN 0121      130 CONTINUE
ISN 0122          IF(JMASS(I,6) .EQ. 0) GO TO 140
ISN 0124          PRINT 6004, IM(ICNT)
ISN 0125     6004 FORMAT(1H1,5X,'MASS ',I3,3X,'ROTATIONAL VELOCITY(RAD/SEC)' //
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                *      1X,'TIME(SEC)',4X,'P',9X,'Q',9X,'R')
ISN 0126           CALL PLOTT(3,NDT,TM,AM(ICNT,19),AM(ICNT,20),AM(ICNT,21))
ISN 0127       140 CONTINUE
ISN 0128           IF(JMASS(I,7) .EQ. 0) GO TO 150
ISN 0130           PRINT 6005, IM(ICNT)
ISN 0131      6005 FORMAT(1H1,5X,'MASS ',I3,3X,'UNFILTERED ACCELERATION(G''S)'
                *      // 1X,'TIME(SEC)',2X,'XACC',6X,'YACC',6X,'ZACC')
ISN 0132           CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,10),AM(ICNT,11),AM(ICNT,12))
ISN 0133       150 CONTINUE
ISN 0134           IF(JMASS(I,8) .EQ. 0) GO TO 160
ISN 0136           PRINT 6006, IM(ICNT)
ISN 0137      6006 FORMAT(1H1,5X,'MASS ',I3,3X,'FILTERED ACCELERATION(G''S)'
                *      // 1X,'TIME(SEC)',2X,'XACCF',5X,'YACCF',5X,'ZACCF')
ISN 0138           CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,13),AM(ICNT,14),AM(ICNT,15))
ISN 0139       160 CONTINUE
ISN 0140           IF(JMASS(I,9) .EQ. 0) GO TO 80
ISN 0142           PRINT 6007, IM(ICNT)
ISN 0143      6007 FORMAT(1H1,5X,'MASS ',I3,3X,'ROTATIONAL ACCELERATION(RAD/SEC**2)'
                *      // 1X,'TIME(SEC)',2X,'PDOT',6X,'QDOT',6X,'RDOT')
ISN 0144           CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,22),AM(ICNT,23),AM(ICNT,24))
ISN 0145        80 CONTINUE
ISN 0146           IF(JMASS(I,10).EQ.0) GO TO 85
ISN 0148           PRINT 6038,IM(ICNT)
ISN 0149      6038 FORMAT(1H1,5X,'MASS',I3,3X,'MASS IMPULSES'//1X,'TIME(SEC)',
               1 2X,'XIMP',6X,'YIMP',6X,'ZIMP')
ISN 0150           CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,25),AM(ICNT,26),AM(ICNT,27))
ISN 0151        85 CONTINUE
ISN 0152        81 IF(NCNT .NE. 0) REWIND 12
ISN 0154        70 CONTINUE
              C
              C    PLOT NODE POINT DATA IF REQUESTED
              C
ISN 0155           IF(NNEP .LE. 0) GO TO 170
ISN 0157           PRINT 7030, NNEP
ISN 0158      7030 FORMAT (1H1,5X,I5,2X,'NODE PLOT FLAG SUMMARY')
ISN 0159           DO 7040 I=1, NNEP
ISN 0160           PRINT 7050,(JNODE(I,J),J=1,8)
ISN 0161      7050 FORMAT (10X,8I8)
ISN 0162      7040 CONTINUE
ISN 0163           REWIND 2
ISN 0164           L = 1
ISN 0165           ICNT = 0
ISN 0166           NCNT = 0
ISN 0167           DO 180 I=1, NNEP
ISN 0168           IFIND = 0
ISN 0169           IF(NNEW .EQ. 0) GO TO 185
ISN 0171           DO 190 J=1, NDT
ISN 0172           DO 200 K=1, NNEW
ISN 0173           READ(2) (TN(L),DUMMY,INM(L),IN(L),(AN(L,M),DUMMY,M=1,18))
ISN 0174           IF(IN(L) .NE. JNODE(I,1) .OR. INM(L) .NE. JNODE(I,2)) GO TO 200
ISN 0176           IFIND = 1
ISN 0177           L = L + 1
ISN 0178           ICNT = ICNT + 1
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ISN 0179      200 CONTINUE                                                        00002000
ISN 0180      190 CONTINUE                                                        00002010
ISN 0181          IF(IFIND .EQ. 1) GO TO 195                                      00002020
ISN 0183      185 PRINT 6024, JNODE(I,2),JNODE(I,1)                               00002030
ISN 0184     6024 FORMAT(1H1,5X,'19. UNABLE TO FIND DATA FOR MASS',I5,            00002040
                 *'  NODE',I5,'.  PLOTS FOR THIS NODE WILL BE SUPPRESSED.')       00002050
ISN 0185      195 IF((ICNT + NDT) .LE. 40) GO TO 210                              00002060
ISN 0187          NCNT = 1                                                        00002070
ISN 0188          DO 220 K=1, ICNT                                                00002080
ISN 0189          WRITE(12) (TN(K),INM(K),IN(K),(AN(K,M),M=1,18))                 00002090
ISN 0190      220 CONTINUE                                                        00002100
ISN 0191          ICNT = 0                                                        00002110
ISN 0192          L = 1                                                           00002120
ISN 0193      210 CONTINUE                                                        00002130
ISN 0194          REWIND 2                                                        00002140
ISN 0195      180 CONTINUE                                                        00002150
ISN 0196          IF(ICNT .EQ. 40 .OR. NCNT .EQ. 0) GO TO 230                     00002160
ISN 0198          DO 240 K=1, ICNT                                                00002170
ISN 0199          WRITE(12) (TN(K),INM(K),IN(K),(AN(K,M),M=1,18))                 00002180
ISN 0200      240 CONTINUE                                                        00002190
ISN 0201      230 CONTINUE                                                        00002200
ISN 0202          IF(NCNT .NE. 0) REWIND 12                                       00002210
ISN 0204          IFIND = 0                                                       00002220
ISN 0205          IC = 0                                                          00002230
ISN 0206          DO 255 I=1, NNEP                                                00002240
ISN 0207          IF(IFIND .EQ. 1) GO TO 2030                                     00002250
ISN 0209          IC = IC + 1                                                     00002260
ISN 0210          IF(NCNT .EQ. 0) GO TO 2020                                      00002270
ISN 0212          IF(IC .GT. NNEW) GO TO 251                                      00002280
ISN 0214          ICNT = 1                                                        00002290
ISN 0215          DO 260 J=1, NDT                                                 00002300
ISN 0216          READ(12) (TN(J),INM(J),IN(J),(AN(J,K),K=1,18))                  00002310
ISN 0217      260 CONTINUE                                                        00002320
ISN 0218          GO TO 2030                                                      00002330
ISN 0219     2020 ICNT = IC * NDT + 1 - NDT                                       00002340
ISN 0220     2030 CONTINUE                                                        00002350
ISN 0221          IF(INM(ICNT) .EQ. JNODE(I,2) .AND. IN(ICNT) .EQ. JNODE(I,1))    00002360
                 *   GO TO 265                                                    00002370
ISN 0223          IFIND = 1                                                       00002380
ISN 0224          GO TO 250                                                       00002390
ISN 0225      265 IFIND = 0                                                       00002400
ISN 0226          IF(JNODE(I,3) .EQ. 0) GO TO 270                                 00002410
ISN 0228          PRINT 6008, INM(ICNT),IN(ICNT)                                  00002420
ISN 0229     6008 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'DISPLACEMENTS(IN)'  // 00002430
                 *      1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')                      00002440
ISN 0230          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,1),AN(ICNT,2),AN(ICNT,3))     00002450
ISN 0231      270 CONTINUE                                                        00002460
ISN 0232          IF(JNODE(I,4) .EQ. 0) GO TO 280                                 00002470
ISN 0234          PRINT 6009, INM(ICNT),IN(ICNT)                                  00002480
ISN 0235     6009 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'VELOCITY(IN/SEC) - GROU00002490
                 *ND AXES' // 1X,'TIME(SEC)',2X,'XDOT',6X,'YDOT',6X,'ZDOT')       00002500
ISN 0236          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,4),AN(ICNT,5),AN(ICNT,6))     00002510
ISN 0237      280 CONTINUE                                                        00002520
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ISN 0238          IF(JNODE(I,5) .EQ. 0) GO TO 290
ISN 0240          PRINT 6010, INM(ICNT),IN(ICNT)
ISN 0241     6010 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'VELOCITY(IN/SEC) - MASS
                 * AXES' // 1X,'TIME(SEC)',4X,'U',9X,'V',9X,'W')
ISN 0242          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,7),AN(ICNT,8),AN(ICNT,9))
ISN 0243      290 CONTINUE
ISN 0244          IF(JNODE(I,6) .EQ. 0) GO TO 300
ISN 0246          PRINT 6011, INM(ICNT),IN(ICNT)
ISN 0247     6011 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'UNFILTERED ACCELERATION
                 *(G''S)' // 1X,'TIME(SEC)',2X,'XACC',6X,'YACC',6X,'ZACC')
ISN 0248          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,10),AN(ICNT,11),AN(ICNT,12))
ISN 0249      300 CONTINUE
ISN 0250          IF(JNODE(I,7) .EQ. 0) GO TO 250
ISN 0252          PRINT 6012, INM(ICNT),IN(ICNT)
ISN 0253     6012 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'FILTERED ACCELERATION(G
                 *''S)' // 1X,'TIME(SEC)',2X,'XACCF',5X,'YACCF',5X,'ZACCF')
ISN 0254          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,13),AN(ICNT,14),AN(ICNT,15))
ISN 0255      250 CONTINUE
ISN 0256          IF(JNODE(I,8).EQ.0) GO TO 255
ISN 0258          PRINT 6039,INM(ICNT),IN(ICNT)
ISN 0259     6039 FORMAT(1H1,5X,'MASS',I3,3X,'NODE',I3,3X,'NODE IMPULSES(G-SEC)'
                 1 //1X,'TIME(SEC)',2X,'XIMPNP',5X,'YIMPNP',5X,'ZIMPNP')
ISN 0260          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,16),AN(ICNT,17),AN(ICNT,18))
ISN 0261      255 CONTINUE
ISN 0262      251 IF(NCNT .NE. 0) REWIND 12
ISN 0264      170 CONTINUE
               C
               C      PLOT BEAM ELEMENT FORCE DATA IF REQUIRED
               C
ISN 0265          IF(NBFP .LE. 0) GO TO 320
ISN 0267          PRINT 7060, NBFP
ISN 0268     7060 FORMAT (1H1,5X,I5,2X,'BEAM FORCE PLOT FLAG SUMMARY')
ISN 0269          DO 7070 I=1, NBFP
ISN 0270          PRINT 7080, (JBMF(I,J), J=1, 4)
ISN 0271     7080 FORMAT (10X,4I8)
ISN 0272     7070 CONTINUE
ISN 0273          REWIND 3
ISN 0274          L = 1
ISN 0275          ICNT = 0
ISN 0276          NCNT = 0
ISN 0277          DO 330 I=1, NBFP
ISN 0278          IFIND = 0
ISN 0279          IF(NBFW .EQ. 0) GO TO 335
ISN 0281          DO 340 J=1, NDT
ISN 0282          DO 350 K=1, NBFW
ISN 0283          READ(3) (TB(L),DUMMY,IB(L),IBG(L),JBG(L),MBG(L),NBG(L),
                 *        (AB(L,M), DUMMY, M=1, 8))
ISN 0284          IF(IB(L) .NE. JBMF(I,1)) GO TO 350
ISN 0286          IFIND = 1
ISN 0287          L = L + 1
ISN 0288          ICNT = ICNT + 1
ISN 0289      350 CONTINUE
ISN 0290      340 CONTINUE
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ISN 0291          IF(IFIND .EQ. 1) GO TO 345
ISN 0293      335 PRINT 6025, JBMF(I,1)
ISN 0294     6025 FORMAT(1H1,5X,'20. UNABLE TO FIND DATA FOR BEAM',I5,
                 *  '. FORCE PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')
ISN 0295      345 IF((ICNT + NDT) .LE. 50) GO TO 360
ISN 0297          NCNT = 1
ISN 0298          DO 370 K=1, ICNT
ISN 0299          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),(AB(K,M),
                 *          M=1, 8))
ISN 0300      370 CONTINUE
ISN 0301          ICNT = 0
ISN 0302          L = 1
ISN 0303      360 CONTINUE
ISN 0304          REWIND 3
ISN 0305      330 CONTINUE
ISN 0306          IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 380
ISN 0308          DO 390 K=1, ICNT
ISN 0309          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),(AB(K,M),
                 *           M=1, 8))
ISN 0310      390 CONTINUE
ISN 0311      380 CONTINUE
ISN 0312          IF(NCNT .NE. 0) REWIND 12
ISN 0314          IFIND = 0
ISN 0315          IC = 0
ISN 0316          DO 400 I=1, NBFP
ISN 0317          IF(IFIND .EQ.1) GO TO 2050
ISN 0319          IC = IC + 1
ISN 0320          IF(NCNT .EQ. 0) GO TO 2040
ISN 0322          IF(IC .GT. NBFW) GO TO 401
ISN 0324          ICNT = 1
ISN 0325          DO 410 J=1, NDT
ISN 0326          READ(12) (TB(J),IB(J),IBG(J),JBG(J),MBG(J),NBG(J),(AB(J,M),
                 *            M=1, 8))
ISN 0327      410 CONTINUE
ISN 0328          GO TO 2050
ISN 0329     2040 ICNT = IC * NDT + 1 - NDT
ISN 0330     2050 CONTINUE
ISN 0331          IF(IB(ICNT) .EQ. JBMF(I,1)) GO TO 415
ISN 0333          IFIND = 1
ISN 0334          GO TO 400
ISN 0335      415 IFIND = 0
ISN 0336          IF(JBMF(I,2) .EQ. 0) GO TO 420
ISN 0338          PRINT 6013, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)
ISN 0339     6013 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',
                 *     I2,5X,'AXIAL AND SHEAR FORCES(LB)' // 1X,'TIME(SEC)',3X,
                 *     'FX',8X,'FY',8X,'FZ')
ISN 0340          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,1),AB(ICNT,2),AB(ICNT,3))
ISN 0341      420 CONTINUE
ISN 0342          IF(JBMF(I,3) .EQ. 0) GO TO 430
ISN 0344          PRINT 6014, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)
ISN 0345     6014 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',
                 *     I2,5X,'MOMENTS AT I,M(IN-LB)' // 1X,'TIME(SEC)',
                 *     3X,'MX',8X,'MY',8X,'MZ')
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ISN 0346          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,5),AB(ICNT,7))      00003590
ISN 0347      430 CONTINUE                                                         00003600
ISN 0348          IF(JBMF(I,4) .EQ. 0) GO TO 400                                   00003610
ISN 0350          PRINT 6015, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)     00003620
ISN 0351     6015 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00003630
                 *       I2,5X,'MOMENTS AT J,N(IN-LB)' // 1X,'TIME(SEC)',           00003640
                 *       3X,'MX',8X,'MY',8X,'MZ')                                   00003650
ISN 0352          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,6),AB(ICNT,8))      00003660
ISN 0353      400 CONTINUE                                                         00003670
ISN 0354      401 IF(NCNT .NE. 0) REWIND 12                                        00003680
ISN 0356      320 CONTINUE                                                         00003690
              C                                                                    00003700
              C   PLOT BEAM ELEMENT DEFLECTION DATA IF REQUIRED                    00003710
              C                                                                    00003720
ISN 0357          IF(NBDP .LE. 0) GO TO 440                                        00003730
ISN 0359          PRINT 7090, NBDP                                                 00003740
ISN 0360     7090 FORMAT (1H1,5X,I5,2X,'BEAM DEFLECTION PLOT FLAG SUMMARY')        00003750
ISN 0361          DO 7100 I=1, NBDP                                                00003760
ISN 0362          PRINT 7080, (JBMD(I,J), J=1, 4)                                  00003770
ISN 0363     7100 CONTINUE                                                         00003780
ISN 0364          REWIND 4                                                         00003790
ISN 0365          L = 1                                                            00003800
ISN 0366          ICNT = 0                                                         00003810
ISN 0367          NCNT = 0                                                         00003820
ISN 0368          DO 450 I=1, NBDP                                                 00003830
ISN 0369          IFIND = 0                                                        00003840
ISN 0370          IF(NBDW .EQ. 0) GO TO 455                                        00003850
ISN 0372          DO 460 J=1, NDT                                                  00003860
ISN 0373          DO 470 K=1, NBDW                                                 00003870
ISN 0374          READ(4) (TB(L),DUMMY,IB(L),IBG(L),JBG(L),MBG(L),NBG(L),          00003880
                 *     (AB(L,M),DUMMY, M=1, 8))                                    00003890
ISN 0375          IF(IB(L) .NE. JBMD(I,1)) GO TO 470                               00003900
ISN 0377          IFIND = 1                                                        00003910
ISN 0378          L = L + 1                                                        00003920
ISN 0379          ICNT = ICNT + 1                                                  00003930
ISN 0380      470 CONTINUE                                                         00003940
ISN 0381      460 CONTINUE                                                         00003950
ISN 0382          IF(IFIND .EQ. 1) GO TO 465                                       00003960
ISN 0384      455 PRINT 6026, JBMD(I,1)                                            00003970
ISN 0385     6026 FORMAT(1H1,5X,'21. UNABLE TO FIND DATA FOR BEAM',I5,             00003980
                 * '. DEFLECTION PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')         00003990
ISN 0386      465 IF((ICNT + NDT) .LE. 50) GO TO 480                               00004000
ISN 0388          NCNT = 1                                                         00004010
ISN 0389          DO 490 K=1, ICNT                                                 00004020
ISN 0390          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),              00004030
                 *          (AB(K,M), M=1, 8))                                     00004040
ISN 0391      490 CONTINUE                                                         00004050
ISN 0392          ICNT = 0                                                         00004060
ISN 0393          L = 1                                                            00004070
ISN 0394      480 CONTINUE                                                         00004080
ISN 0395          REWIND 4                                                         00004090
ISN 0396      450 CONTINUE                                                         00004100
ISN 0397          IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 500                      00004110
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ISN 0399          DO 510 K=1, ICNT
ISN 0400          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),
                *          (AB(K,M), M=1, 8))
ISN 0401      510 CONTINUE
ISN 0402      500 CONTINUE
ISN 0403          IF(NCNT .NE. 0) REWIND 12
ISN 0405          IFIND = 0
ISN 0406          IC = 0
ISN 0407          DO 520 I=1, NBDP
ISN 0408          IF(IFIND .EQ. 1) GO TO 2070
ISN 0410          IC = IC + 1
ISN 0411          IF(NCNT .EQ. 0) GO TO 2060
ISN 0413          IF(IC .GT. NBDW) GO TO 521
ISN 0415          ICNT = 1
ISN 0416          DO 530 J=1, NDT
ISN 0417          READ(12) (TB(J),IB(J),IBG(J),JBG(J),MBG(J),NBG(J),
                *          (AB(J,M), M=1, 8))
ISN 0418      530 CONTINUE
ISN 0419          GO TO 2070
ISN 0420     2060 ICNT = IC * NDT + 1 - NDT
ISN 0421     2070 CONTINUE
ISN 0422          IF(IB(ICNT) .EQ. JBMD(I,1)) GO TO 535
ISN 0424          IFIND = 1
ISN 0425          GO TO 520
ISN 0426      535 IFIND = 0
ISN 0427          IF(JBMD(I,2) .EQ. 0) GO TO 540
ISN 0429          PRINT 6016, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)
ISN 0430     6016 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',
                *       I2,5X,'RELATIVE DEFLECTIONS*J-I*(IN)' // 1X,'TIME(SEC)',
                *       4X,'X',9X,'Y',9X,'Z')
ISN 0431          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,1),AB(ICNT,2),AB(ICNT,3))
ISN 0432      540 CONTINUE
ISN 0433          IF(JBMD(I,3) .EQ. 0) GO TO 550
ISN 0435          PRINT 6017, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)
ISN 0436     6017 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',
                *       I2,5X,'RELATIVE ROTATIONS*J-I*(DEGREE)'  // 1X,'TIME(SEC)',
                *       3X,'PHI',6X,'THETA',6X,'PSI')
ISN 0437          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,5),AB(ICNT,6))
ISN 0438      550 CONTINUE
ISN 0439          IF(JBMD(I,4) .EQ. 0) GO TO 520
ISN 0441          PRINT 6018, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)
ISN 0442     6018 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',
                *       I2,5X,'RELATIVE ROTATIONS*J+I*(DEGREE)' // 1X,'TIME(SEC)',
                *       3X,'PHI',6X,'THETA',6X,'PSI')
ISN 0443          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,7),AB(ICNT,8))
ISN 0444      520 CONTINUE
ISN 0445      521 IF(NCNT .NE. 0) REWIND 12
ISN 0447      440 CONTINUE
            C
            C     PLOT BEAM STRESS DATA IF REQUIRED
            C
ISN 0448          IF(NSTP .LE. 0) GO TO 850
ISN 0450          PRINT 7110, NSTP
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ISN 0451      7110 FORMAT (1H1,5X,I5,2X,'BEAM STRESS PLOT FLAG SUMMARY')
ISN 0452           DO 7120 I=1, NSTP
ISN 0453           PRINT 7130, (JBMS(I,J), J=1, 6)
ISN 0454      7130 FORMAT (10X,6I8)
ISN 0455      7120 CONTINUE
ISN 0456           REWIND 13
ISN 0457           L = 1
ISN 0458           ICNT = 0
ISN 0459           NCNT = 0
ISN 0460           DO 860 I=1, NSTP
ISN 0461           IFIND = 0
ISN 0462           IF(NSTW .EQ. 0) GO TO 865
ISN 0464           DO 870 J=1, NDT
ISN 0465           DO 880 K=1, NSTW
ISN 0466           READ(13) (TT(L),DUMMY,IT(L),ITG(L),JTG(L),MTG(L),NTG(L),
                  *       (AT(L,M),DUMMY,M=1,10))
ISN 0467           IF(IT(L) .NE. JBMS(I,1)) GO TO 880
ISN 0469           IFIND = 1
ISN 0470           L = L + 1
ISN 0471           ICNT = ICNT + 1
ISN 0472       880 CONTINUE
ISN 0473       870 CONTINUE
ISN 0474           IF(IFIND .EQ. 1) GO TO 875
ISN 0476       865 PRINT 6029, JBMS(I,1)
ISN 0477      6029 FORMAT(1H1,5X,'22. UNABLE TO FIND DATA FOR BEAM',I5,
                  * '.  STRESS PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')
ISN 0478       875 IF((ICNT + NDT) .LE. 50) GO TO 890
ISN 0480           NCNT = 1
ISN 0481           DO 900 K=1, ICNT
ISN 0482           WRITE(12) (TT(K),IT(K),ITG(K),JTG(K),MTG(K),NTG(K),
                  *         (AT(K,M),M=1,10))
ISN 0483       900 CONTINUE
ISN 0484           ICNT = 0
ISN 0485           L = 1
ISN 0486       890 CONTINUE
ISN 0487           REWIND 13
ISN 0488       860 CONTINUE
ISN 0489           IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 910
ISN 0491           DO 920 K=1, ICNT
ISN 0492           WRITE(12) (TT(K),IT(K),ITG(K),JTG(K),MTG(K),NTG(K),
                  *         (AT(K,M),M=1,10))
ISN 0493       920 CONTINUE
ISN 0494       910 CONTINUE
ISN 0495           IF(NCNT .NE. 0) REWIND 12
ISN 0497           IFIND = 0
ISN 0498           IC = 0
ISN 0499           DO 930 I=1, NSTP
ISN 0500           IF(IFIND .EQ.1) GO TO 2090
ISN 0502           IC = IC + 1
ISN 0503           IF(NCNT .EQ. 0) GO TO 2080
ISN 0505           IF(IC .GT. NSTW) GO TO 931
ISN 0507           ICNT = 1
ISN 0508           DO 940 J=1, NDT
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AD-A055 898   LOCKHEED-CALIFORNIA CO BURBANK   F/G 1/2
GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MAN--ETC(U)
FEB 78 M A GAMON   DOT-FA75WA-3707
UNCLASSIFIED   LR-28307   FAA/RD-77/189-VOL-1   NL

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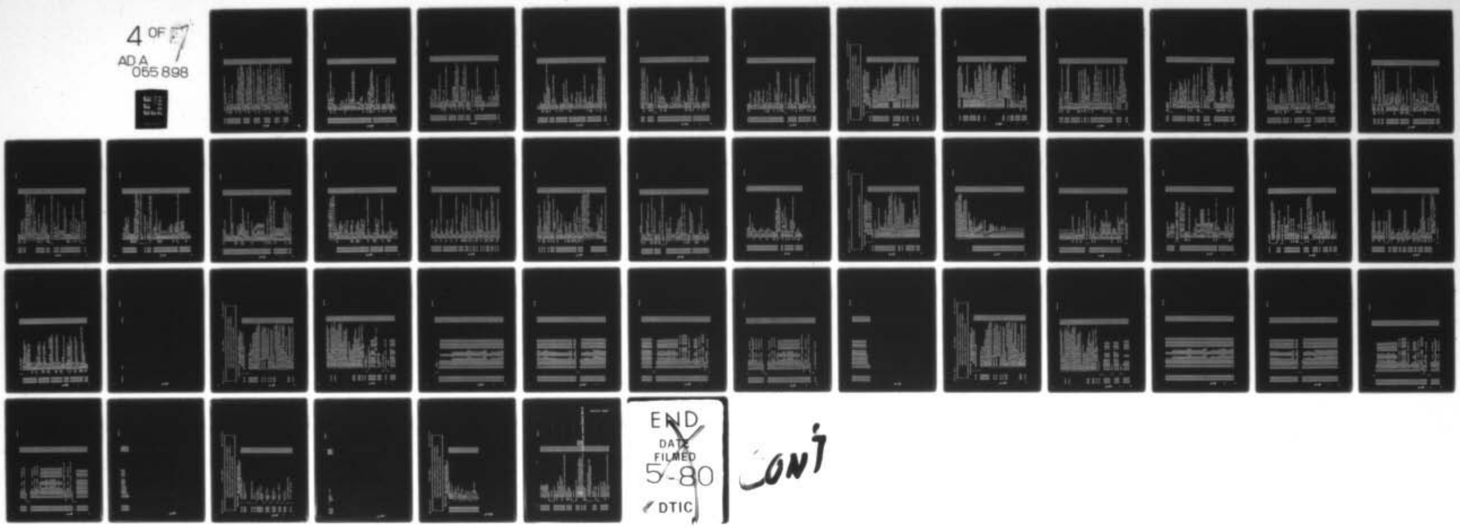
AD A 055 898



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ISN 0509          READ(12) (TT(J),IT(J),ITG(J),JTG(J),MTG(J),NTG(J),
                 *       (AT(J,M),M=1,10))
ISN 0510      940 CONTINUE
ISN 0511          GO TO 2090
ISN 0512     2080 ICNT = IC * NDT + 1 - NDT
ISN 0513     2090 CONTINUE
ISN 0514          IF(IT(ICNT) .EQ. JBMS(I,1)) GO TO 945
ISN 0516          IFIND = 1
ISN 0517          GO TO 930
ISN 0518      945 IFIND = 0
ISN 0519          IF(JBMS(I,2) .EQ. 0) GO TO 950
ISN 0521          PRINT 6070, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)
ISN 0522     6070 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (MAXIMUM SHEAR STRESS THEORY) A
                 *T TOP AND BOTTOM OF BEAM' // 1X,'TIME(SEC)',3X,'TOP',6X,'BOTTOM')
ISN 0523          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,1),AT(ICNT,2),TT(ICNT))
ISN 0524      950 CONTINUE
ISN 0525          IF(JBMS(I,3) .EQ. 0) GO TO 960
ISN 0527          PRINT 6080, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)
ISN 0528     6080 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (MAXIMUM SHEAR STRESS THEORY) A
                 *T LEFT AND RIGHT EDGE OF BEAM' // 1X,'TIME(SEC)',3X,'LEFT',5X,
                 *'RIGHT')
ISN 0529          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,3),AT(ICNT,4),TT(ICNT))
ISN 0530      960 CONTINUE
ISN 0531          IF(JBMS(I,4) .EQ. 0) GO TO 970
ISN 0533          PRINT 6090, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)
ISN 0534     6090 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (THEORY OF CONST. ENERGY OF DIS
                 *T.) AT TOP AND BOTTOM OF BEAM' // 1X,'TIME(SEC)',
                 *3X,'TOP',6X,'BOTTOM')
ISN 0535          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,5),AT(ICNT,6),TT(ICNT))
ISN 0536      970 CONTINUE
ISN 0537          IF(JBMS(I,5) .EQ. 0) GO TO 980
ISN 0539          PRINT 6100, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)
ISN 0540     6100 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (THEORY OF CONST. ENERGY OF DIS
                 *T.) AT LEFT AND RIGHT EDGE OF BEAM' // 1X,'TIME(SEC)',
                 *3X,'LEFT',5X,'RIGHT')
ISN 0541          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,7),AT(ICNT,8),TT(ICNT))
ISN 0542      980 IF(JBMS(I,6) .EQ. 0) GO TO 930
ISN 0544          PRINT 6110, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)
ISN 0545     6110 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M =',I4,',',I2,5X,
                 *'J,N =',I4,',',I2,5X,'AXIAL STRESS AND BUCKLING LOAD RATIOS' //
                 *1X,'TIME(SEC)',2X,'AXIAL',4X,'BUCKLING' / 11X,
                 *'STRESS',5X,'LOAD')
ISN 0546          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,9),AT(ICNT,10),TT(ICNT))
ISN 0547      930 CONTINUE
ISN 0548      931 IF(NCNT .NE. 0) REWIND 12
ISN 0550      850 CONTINUE
            C
            C     PLOT EXTERNAL SPRING DATA IF REQUIRED
            C
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ISN 0551           IF(NSEP .EQ. 0) GO TO 580                                      00005710
ISN 0553           PRINT 7140, NSEP                                               00005720
ISN 0554      7140 FORMAT (1H1,5X,I5,2X,'EXTERNAL SPRING PLOT FLAG SUMMARY')      00005730
ISN 0555           DO 7150 I=1, NSEP                                              00005740
ISN 0556           PRINT 7080, (JSPR(I,J), J=1, 4)                                00005750
ISN 0557      7150 CONTINUE                                                       00005760
ISN 0558           REWIND 8                                                       00005770
ISN 0559           L = 1                                                          00005780
ISN 0560           ICNT = 0                                                       00005790
ISN 0561           NCNT = 0                                                       00005800
ISN 0562           DO 545 I=1, 40                                                 00005810
ISN 0563           DO 545 J=1, 6                                                  00005820
ISN 0564           AS(I,J) = 0.0                                                  00005830
ISN 0565       545 CONTINUE                                                       00005840
ISN 0566           DO 555 I=1, NSEP                                               00005850
ISN 0567           IFIND = 0                                                      00005860
ISN 0568           IF(NSEW .EQ. 0) GO TO 556                                      00005870
ISN 0570           DO 560 J=1, NDT                                                00005880
ISN 0571           DO 570 K=1, NSEW                                               00005890
ISN 0572           READ(8) (TSD,DUMMY,JSM,JSK,JSN,ADUM1,DUMMY,ADUM2,DUMMY)        00005900
ISN 0573           IF(JSM .NE. JSPR(I,1) .OR. JSN .NE. JSPR(I,2)) GO TO 570       00005910
ISN 0575           IFIND = 1                                                      00005920
ISN 0576           TS(L) = TSD                                                    00005930
ISN 0577           ISM(L) = JSM                                                   00005940
ISN 0578           ISN(L) =JSN                                                    00005950
ISN 0579           AS(L,JSK) = ADUM1                                              00005960
ISN 0580           AS(L,JSK+3) = ADUM2                                            00005970
ISN 0581       570 CONTINUE                                                       00005980
ISN 0582           L = L + 1                                                      00005990
ISN 0583           ICNT = ICNT + 1                                                00006000
ISN 0584       560 CONTINUE                                                       00006010
ISN 0585           IF(IFIND .EQ. 1) GO TO 565                                     00006020
ISN 0587       556 PRINT 6027, JSPR(I,1),JSPR(I,2)                                00006030
ISN 0588      6027 FORMAT(1H1,5X,'23. UNABLE TO FIND DATA FOR SPRING',I5,         00006040
                  *  ' NODE',I5,'.  PLOTS FOR THIS SPRING WILL BE SUPPRESSED.')   00006050
ISN 0589       565 IF((ICNT + NDT) .LE. 40) GO TO 590                             00006060
ISN 0591           NCNT = 1                                                       00006070
ISN 0592           DO 600 K=1, ICNT                                               00006080
ISN 0593           WRITE(12) (TS(K),ISM(K),ISN(K),(AS(K,M), M=1, 6))              00006090
ISN 0594       600 CONTINUE                                                       00006100
ISN 0595           ICNT = 0                                                       00006110
ISN 0596           L = 1                                                          00006120
ISN 0597       590 CONTINUE                                                       00006130
ISN 0598           REWIND 8                                                       00006140
ISN 0599       555 CONTINUE                                                       00006150
ISN 0600           IF(ICNT .EQ. 40 .OR. NCNT .EQ. 0) GO TO 610                    00006160
ISN 0602           DO 620 K=1, ICNT                                               00006170
ISN 0603           WRITE(12) (TS(K),ISM(K),ISN(K),(AS(K,M), M=1, 6))              00006180
ISN 0604       620 CONTINUE                                                       00006190
ISN 0605       610 CONTINUE                                                       00006200
ISN 0606           IF(NCNT .NE. 0) REWIND 12                                      00006210
ISN 0608           IFIND = 0                                                      00006220
ISN 0609           IC = 0                                                         00006230
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ISN 0610          DO 630 I=1, NSEP                                                00006240
ISN 0611          IF(IFIND .EQ. 1) GO TO 2110                                     00006250
ISN 0613          IC = IC + 1                                                     00006260
ISN 0614          IF(NCNT .EQ. 0) GO TO 2100                                      00006270
ISN 0616          IF(IC .GT. NSEW) GO TO 631                                      00006280
ISN 0618          ICNT = 1                                                        00006290
ISN 0619          DO 640 J=1, NDT                                                 00006300
ISN 0620          READ(12) (TS(J),ISM(J),ISN(J),(AS(J,M), M=1, 6))                00006310
ISN 0621      640 CONTINUE                                                        00006320
ISN 0622          GO TO 2110                                                      00006330
ISN 0623     2100 ICNT = IC * NDT + 1 - NDT                                       00006340
ISN 0624     2110 CONTINUE                                                        00006350
ISN 0625          IF(ISM(ICNT) .EQ. JSPR(I,1) .AND. ISN(ICNT) .EQ. JSPR(I,2))     00006360
         *     GO TO 645                                                          00006370
ISN 0627          IFIND = 1                                                       00006380
ISN 0628          GO TO 630                                                       00006390
ISN 0629      645 IFIND = 0                                                       00006400
ISN 0630          IF(JSPR(I,3) .EQ. 0) GO TO 650                                  00006410
ISN 0632          PRINT 6019, ISM(ICNT),ISN(ICNT)                                 00006420
ISN 0633     6019 FORMAT(1H1,5X,'EXTERNAL SPRING   I,M =',I4,',',I2,5X,           00006430
         *          'COMPRESSION(IN)' // 1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')     00006440
ISN 0634          CALL PLOTT(3,NDT,TS(ICNT),AS(ICNT,1),AS(ICNT,2),AS(ICNT,3))     00006450
ISN 0635      650 CONTINUE                                                        00006460
ISN 0636          IF(JSPR(I,4) .EQ. 0) GO TO 630                                  00006470
ISN 0638          PRINT 6020, ISM(ICNT),ISN(ICNT)                                 00006480
ISN 0639     6020 FORMAT(1H1,5X,'EXTERNAL SPRING   I,M =',I4,',',I2,5X,           00006490
         *          'AXIAL LOAD(LB)' // 1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')      00006500
ISN 0640          CALL PLOTT(3,NDT,TS(ICNT),AS(ICNT,4),AS(ICNT,5),AS(ICNT,6))     00006510
ISN 0641      630 CONTINUE                                                        00006520
ISN 0642      631 IF(NCNT .NE. 0) REWIND 12                                       00006530
ISN 0644      580 CONTINUE                                                        00006540
        C                                                                         00006550
        C         PLOT STRAIN&DAMPING ENERGY                                      00006560
        C                                                                         00006570
ISN 0645          IF(NENP.EQ.0) GO TO 581                                         00006580
ISN 0647          PRINT 7161,NENP                                                 00006590
ISN 0648     7161 FORMAT(1H1,5X,I5,2X,'STRAIN AND DAMPING PLOT FLAG SUMMARY')     00006600
ISN 0649          DO 7162 I=1,NENP                                                00006610
ISN 0650          PRINT 7080,(JENG(I,J),J=1,3)                                    00006620
ISN 0651     7081 FORMAT(10X,3I8)                                                 00006630
ISN 0652     7162 CONTINUE                                                        00006640
ISN 0653          REWIND 11                                                       00006650
ISN 0654          L=1                                                             00006660
ISN 0655          ICNT=0                                                          00006670
ISN 0656          NCNT=0                                                          00006680
ISN 0657          DO 331 I=1,NENP                                                 00006690
ISN 0658          IFIND=0                                                         00006700
ISN 0659          IF(NENW.EQ.0) GO TO 336                                         00006710
ISN 0661          DO 341 J=1,NDT                                                  00006720
ISN 0662          DO 351 K=1,NENW                                                 00006730
ISN 0663          READ(11) (TE(L),DUMMY,IE(L),IEG(L),MEG(L),JEG(L),NEG(L),        00006740
         1 (AE(L,M),DUMMY,M=1,4))                                                 00006750
ISN 0664          IF(IE(L).NE.JENG(I,1)) GO TO 351                                00006760
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ISN 0666          IFIND=1                                                 00006770
ISN 0667          L=L+1                                                   00006780
ISN 0668          ICNT=ICNT+1                                             00006790
ISN 0669      351 CONTINUE                                                00006800
ISN 0670      341 CONTINUE                                                00006810
ISN 0671          IF(IFIND.EQ.1) GO TO 346                                00006820
ISN 0673      336 PRINT 6040,JENG(I,1)                                    00006830
ISN 0674     6040 FORMAT(1H1,5X,'26.UNABLE TO FIND DATA FOR BEAM',I5,'.ENERGY PLOTS 00006840
                 1 FOR THIS BEAM WILL BE SUPPRESSED.')                    00006850
ISN 0675      346 IF((ICNT+NDT).LE.50) GO TO 361                          00006860
ISN 0677          NCNT=1                                                  00006870
ISN 0678          DO 371 K=1,ICNT                                         00006880
ISN 0679          WRITE(12) (TE(K),IE(K),IEG(K),MEG(K),JEG(K),NEG(K),     00006890
                 1 (AE(L,M),M=1,4))                                       00006900
ISN 0680      371 CONTINUE                                                00006910
ISN 0681          ICNT=0                                                  00006920
ISN 0682          L=1                                                     00006930
ISN 0683      361 CONTINUE                                                00006940
ISN 0684          REWIND 11                                               00006950
ISN 0685      331 CONTINUE                                                00006960
ISN 0686          IF(ICNT.EQ.50.OR.NCNT.EQ.0) GO TO 381                   00006970
ISN 0688          DO 391 K=1,ICNT                                         00006980
ISN 0689          WRITE(12) (TE(K),IE(K),MEG(K),JEG(K),NEG(K),            00006990
                 1 (AE(L,M),M=1,4))                                       00007000
ISN 0690      391 CONTINUE                                                00007010
ISN 0691      381 CONTINUE                                                00007020
ISN 0692          IF(NCNT.NE.0) REWIND 12                                 00007030
ISN 0694          IFIND=0                                                 00007040
ISN 0695          IC=0                                                    00007050
ISN 0696          DO 402 I=1,NENP                                         00007060
ISN 0697          IF(IFIND.EQ.1) GO TO 2051                               00007070
ISN 0699          IC=IC+1                                                 00007080
ISN 0700          IF(NCNT.EQ.0) GO TO 2041                                00007090
ISN 0702          IF(IC.GT.NENW) GO TO 403                                00007100
ISN 0704          ICNT=1                                                  00007110
ISN 0705          DO 411 J=1,NDT                                          00007120
ISN 0706          READ(12) (TE(J),IE(J),IEG(J),MEG(J),JEG(J),NEG(J),      00007130
                 1 (AE(J,M),M=1,4))                                       00007140
ISN 0707      411 CONTINUE                                                00007150
ISN 0708          GO TO 2051                                              00007160
ISN 0709     2041 ICNT=IC*NDT+1-NDT                                       00007170
ISN 0710     2051 CONTINUE                                                00007180
ISN 0711          IF(IE(ICNT).EQ.JENG(I,1)) GO TO 416                     00007190
ISN 0713          IFIND=1                                                 00007200
ISN 0714          GO TO 402                                               00007210
ISN 0715      416 IFIND=0                                                 00007220
ISN 0716          IF(JENG(I,2).EQ.0) GO TO 421                            00007230
ISN 0718          PRINT 6050,IE(ICNT),IEG(ICNT),MEG(ICNT),JEG(ICNT),NEG(ICNT) 00007240
ISN 0719     6050 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M=',I4,',',I2,5X,'J,N=',I4,',',I2, 00007250
                 1 5X,'STRAIN ENERGY AND PERCENT'//1X,'TIME(SEC)',3X,'SE',8X, 00007260
                 2  '%')                                                  00007270
ISN 0720          CALL PLOTT(2,NDT,TE(ICNT),AE(ICNT,1),AE(ICNT,2))       00007280
ISN 0721      421 CONTINUE                                                00007290
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ISN 0722         IF(JENG(I,3).EQ.0) GO TO 431                                      00007300
ISN 0724         PRINT 6051,IE(ICNT),IEG(ICNT),MEG(ICNT),JEG(ICNT),NEG(ICNT)        00007310
ISN 0725    6051 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M=',I4,',',I2,5X,'J,N=',I4,         00007320
                1 ',',I2,5X,'DAMPING ENERGY AND PERCENT'// 1X,'TIME(SEC)',3X,      00007330
                2 'DE',8X,'%')                                                     00007340
ISN 0726         CALL PLOTT(2,NDT,TE(ICNT),AE(ICNT,3),AE(ICNT,4))                  00007350
ISN 0727     431 CONTINUE                                                          00007360
ISN 0728     402 CONTINUE                                                          00007370
ISN 0729     403 IF(NCNT.NE.0) REWIND 12                                           00007380
ISN 0731     581 CONTINUE                                                          00007390
            C                                                                      00007400
            C    PLOT DRI MASS DATA IF REQUIRED                                    00007410
            C                                                                      00007420
ISN 0732         IF(NDRP .EQ. 0) GO TO 660                                         00007430
ISN 0734         PRINT 7160, NDRP                                                  00007440
ISN 0735    7160 FORMAT (1H1,5X,I5,2X,'DRI PLOT FLAG SUMMARY')                     00007450
ISN 0736         DO 7170 I=1, NDRP                                                 00007460
ISN 0737         PRINT 7180, (JDRI(I))                                             00007470
ISN 0738    7180 FORMAT (10X,I8)                                                   00007480
ISN 0739    7170 CONTINUE                                                          00007490
ISN 0740         REWIND 9                                                          00007500
ISN 0741         L = 1                                                             00007510
ISN 0742         ICNT = 0                                                          00007520
ISN 0743         NCNT = 0                                                          00007530
ISN 0744         DO 670 I=1, NDRP                                                  00007540
ISN 0745         IFIND = 0                                                         00007550
ISN 0746         IF(NDRW .EQ. 0) GO TO 675                                         00007560
ISN 0748         DO 680 J=1, NDT                                                   00007570
ISN 0749         DO 690 K=1, NDRW                                                  00007580
ISN 0750         READ(9) (TD(L),DUMMY,IDM(L),AD(L),DUMMY)                          00007590
ISN 0751         IF(IDM(L) .NE. JDRI(I)) GO TO 690                                 00007600
ISN 0753         IFIND = 1                                                         00007610
ISN 0754         L = L + 1                                                         00007620
ISN 0755         ICNT = ICNT + 1                                                   00007630
ISN 0756     690 CONTINUE                                                          00007640
ISN 0757     680 CONTINUE                                                          00007650
ISN 0758         IF(IFIND .EQ. 1) GO TO 685                                        00007660
ISN 0760     675 PRINT 6028, JDRI(I)                                               00007670
ISN 0761    6028 FORMAT(1H1,5X,'24. UNABLE TO FIND DATA FOR DRI MASS',I5,          00007680
                * '. PLOTS FOR THIS DRI MASS WILL BE SUPPRESSED.')                 00007690
ISN 0762     685 IF((ICNT + NDT) .LE. 100) GO TO 700                               00007700
ISN 0764         NCNT = 1                                                          00007710
ISN 0765         DO 710 K=1, ICNT                                                  00007720
ISN 0766         WRITE(12) (TD(K),IDM(K),AD(K))                                    00007730
ISN 0767     710 CONTINUE                                                          00007740
ISN 0768         ICNT = 0                                                          00007750
ISN 0769         L = 1                                                             00007760
ISN 0770     700 CONTINUE                                                          00007770
ISN 0771         REWIND 9                                                          00007780
ISN 0772     670 CONTINUE                                                          00007790
ISN 0773         IF(ICNT .EQ. 100 .OR. NCNT .EQ. 0) GO TO 720                      00007800
ISN 0775         DO 730 K=1, ICNT                                                  00007810
ISN 0776         WRITE(12) (TD(K),IDM(K),AD(K))                                    00007820
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ISN 0777       730 CONTINUE                                                   00007830
ISN 0778       720 CONTINUE                                                   00007840
ISN 0779           IF(NCNT .NE. 0) REWIND 12                                  00007850
ISN 0781           IFIND = 0                                                  00007860
ISN 0782           IC = 0                                                     00007870
ISN 0783           DO 740 I=1, NDRP                                           00007880
ISN 0784           IF(IFIND .EQ. 1) GO TO 2130                                00007890
ISN 0786           IC = IC + 1                                                00007900
ISN 0787           IF(NCNT .EQ. 0) GO TO 2120                                 00007910
ISN 0789           IF(IC .GT. NDRW) GO TO 741                                 00007920
ISN 0791           ICNT = 1                                                   00007930
ISN 0792           DO 750 J=1, NDT                                            00007940
ISN 0793           READ(12) (TD(J),IDM(J),AD(J))                              00007950
ISN 0794       750 CONTINUE                                                   00007960
ISN 0795           GO TO 2130                                                 00007970
ISN 0796      2120 ICNT = IC * NDT + 1 - NDT                                  00007980
ISN 0797      2130 CONTINUE                                                   00007990
ISN 0798           IF(IDM(ICNT) .EQ. JDRI(I)) GO TO 755                       00008000
ISN 0800           IFIND = 1                                                  00008010
ISN 0801           GO TO 740                                                  00008020
ISN 0802       755 IFIND = 0                                                  00008030
ISN 0803           IF(JDRI(I) .EQ. 0) GO TO 740                               00008040
ISN 0805           PRINT 6021, IDM(ICNT)                                      00008050
ISN 0806      6021 FORMAT(1H1,5X,'DRI MASS ',I3 // 1X,'TIME(SEC)',3X,'DRI')   00008060
ISN 0807           CALL PLOTT(1,NDT,TD(ICNT),AD(ICNT),TD(ICNT),TD(ICNT))      00008070
ISN 0808       740 CONTINUE                                                   00008080
ISN 0809       741 IF(NCNT .NE. 0) REWIND 12                                  00008090
ISN 0811       660 CONTINUE                                                   00008100
             C                                                                00008110
             C     PLOT VEHICLE C.G. DATA                                     00008120
             C                                                                00008130
ISN 0812           REWIND 10                                                  00008140
ISN 0813           DO 760 I=1, NDT                                            00008150
ISN 0814           READ(10,ERR=999) (TV(I),DUMMY,(AV(I,M),DUMMY, M=1, 3))     00008160
ISN 0815       760 CONTINUE                                                   00008170
ISN 0816           ICNT = 1                                                   00008180
ISN 0817           PRINT 6022                                                 00008190
ISN 0818      6022 FORMAT(1H1,5X,'VEHICLE C.G. VELOCITY(IN/SEC)' //           00008200
                *        1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')                 00008210
ISN 0819           CALL PLOTT(3,NDT,TV(ICNT),AV(1,1),AV(1,2),AV(1,3))         00008220
ISN 0820       800 CONTINUE                                                   00008230
ISN 0821           RETURN                                                     00008240
ISN 0822       999 CONTINUE                                                   00008250
ISN 0823           PRINT 1000,I,NDT                                           00008260
ISN 0824           PRINT 1003                                                 00008270
ISN 0825           DO 998 I1=1,I                                              00008280
ISN 0826       998   PRINT 1001,TV(I1),(AV(I1,M),M=1,3)                       00008290
ISN 0827           RETURN                                                     00008300
ISN 0828      1000 FORMAT(/// '25. ***ERROR PLOT***' / 10X,'I = ',I4,5X,      00008310
                *        'NDT = ',I4)                                         00008320
ISN 0829      1001 FORMAT(1X,1P4E15.5)                                        00008330
ISN 0830      1003 FORMAT(// 10X,'TVI  ',7X,'AV(I1,1)',7X,'AV(I1,2)',7X,'AV(I1,3)') 00008340
ISN 0831           END                                                        00008350
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******************************************************************************************
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COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                 SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
         C          DATA SET D2334PRINT AT LEVEL 022 AS OF 06/25/79
         C          DATA SET D2332XPR   AT LEVEL 012 AS OF 05/22/78
         C          DATA SET D2332FPR   AT LEVEL 006 AS OF 02/08/78
ISN 0002       SUBROUTINE PRINT
         C
ISN 0003       IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004       REAL*8 KUN,KEI,KETOTL,MINDT
ISN 0005       REAL*4 ENGSMY(6,200),ETIME(200)
ISN 0006       REAL*4 XKS,XKI,XKR,CLTEST
ISN 0007       INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)
ISN 0008       INTEGER*4 TITLE(40)
ISN 0009       INTEGER*2 NTOL1,NTOL2,NTOL3
ISN 0010       INTEGER*2 NLSFLG,CHUG,N1,NN,IG,JG,IEER,IESE,IEPSE,IEDE,IEPDE
ISN 0011       INTEGER*2 IECE,IEPCE,IEFE,IEPFE,IEDEV,IETOT
ISN 0012       INTEGER*2 IJPR,INBUFF,II(40),KK(40)
ISN 0013       INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE
ISN 0014       INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)
ISN 0015       INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
              *          JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),
              *          JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),
              *          NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0016       DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)
ISN 0017       DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)
ISN 0018       DIMENSION VEE2(6,150),TEMP(7),DEV(200)
ISN 0019       DIMENSION IPLN(15)
ISN 0020       DIMENSION A(50),B(50)
ISN 0021       COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10),
              *              NMPTS(10),MNUM(50,10),ISCALE(10)
ISN 0022       COMMON/CFPR/FSPRNG(40,8),DELG(40)
ISN 0023       COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),
              1           FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)
ISN 0024       COMMON/DEIC/ WTOT,CLTEST(150)
ISN 0025       COMMON/DEIN/ XNBAR,XFBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
              1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
              2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
              3 MVP
ISN 0026       COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),
              1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),
              2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN
ISN 0027       COMMON/DEMA/ DEVMAX
ISN 0028       COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
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                  1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0029            COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),
                  1                XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,
                  2                PETOTL,SETOTL,DETOTL,CETOTL,FETOTL
ISN 0030            COMMON/INIDCP/ YDP(80)
ISN 0031            COMMON/INPR/  NDRI,NSP
ISN 0032            COMMON/MAPR/ ETOTT0,ENGSMY,INGSCT
ISN 0033            COMMON/MAPR1/ DEV,ETIME,IEER,IESE,IEPSE,IEDE,IEPDE,IECE,IEPCE,
                  1 IEFE,IEPFE,IEDEV,IETOT
ISN 0034            COMMON/MCFIII/ SYMFLG
ISN 0035            COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0036            COMMON/NP01I2/ II,KK,MM
ISN 0037            COMMON/NP00I4/ NNP
ISN 0038            COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,
                  1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)
ISN 0039            COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3
ISN 0040            COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),
                  1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                  2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                  3 YIMNPL(50),ZIMNPL(50)
ISN 0041            COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                  1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                  2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                  3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                  4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                  5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                  6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                  7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                  8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                  9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                  A CEIKF(40),
                  B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                  C NM,NB,I,J,IG(150),JG(150),
                  D N1(900),NN(40),IJPR(150)
ISN 0042            COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP
ISN 0043            COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                  *               JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,
                  *               NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0044            COMMON /MAX/  IRUPSW(150),IPENSW(80),VEEBAR(900),ZINIT(80),
                  1             DPHIIJ(150),FUB(150)
ISN 0045            COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR
ISN 0046            EQUIVALENCE (VEE(1),VEE2(1,1))
ISN 0047            DATA IPLN /
                  *'X(+AFT) - Y(+RIGHT) X(+AFT) - Z(+UP)     Y(+RIGHT) - Z(+UP)  ' /
ISN 0048            ILINES = 60
ISN 0049            IPL = 6
ISN 0050            IF(NRP .LE. 0) IPL = 2
ISN 0052            ITTL = 9
              C FORCE NEW PAGE
ISN 0053            NPR = 1000
ISN 0054            DO 3099 I = 1,NM
ISN 0055            IF (ILINES-NPR-IPL) 3010,3020,3020
ISN 0056       3010 PRINT 3100,TITLE
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ISN 0057      3100 FORMAT(1H1,20A4 / 1X,20A4 / )                                 00000940
ISN 0058           PRINT 3200,TIME,IPC                                           00000950
ISN 0059      3200 FORMAT(1H ,6HTIME =,F9.6,5X,'NUMBER OF INTEGRATION INTERVALS =',  00000960
                  1 I4/)                                                         00000970
ISN 0060           IF(NRP .GT. 0) PRINT 3201                                     00000980
ISN 0062           IF(NRP .LE. 0) PRINT 3214                                     00000990
ISN 0064      3201 FORMAT(1X,'MASS DISPLACEMENTS,VELOCITIES,AND ACCELERATIONS' / )  00001000
ISN 0065      3214 FORMAT(1X,'NO MASS RESPONSE DATA REQUESTED EXCEPT TRANSLATIONAL AC00001010
                  *CELERATIONS' / )                                              00001020
ISN 0066           IF(NRP .LE. 0) GO TO 3018                                     00001030
ISN 0068           PRINT 3300                                                    00001040
ISN 0069           PRINT 400                                                     00001050
ISN 0070           PRINT 500                                                     00001060
ISN 0071           PRINT 600                                                     00001070
ISN 0072      3018 PRINT 900                                                     00001080
ISN 0073      3300 FORMAT(1H ,18X,1HX,14X,1HY,14X,1HZ,13X,3HPHI,11X,5HTHETA,     00001090
                  1  11X,3HPSI)                                                  00001100
ISN 0074       400 FORMAT(1H ,17X,4HXDOT,11X,4HYDOT,11X,4HZDOT,10X,6HPHIDOT,     00001110
                  1  8X,8HTHETADOT,8X,6HPSIDOT)                                  00001120
ISN 0075       500 FORMAT(1H ,18X,1HU,14X,1HV,14X,1HW,14X,1HP,14X,1HQ,14X,1HR)   00001130
ISN 0076       600 FORMAT(1H ,17X,4HUDOT,11X,4HVDOT,11X,4HWDOT,11X,4HPDOT,11X,   00001140
                  1  4HQDOT,11X,4HRDOT)                                          00001150
ISN 0077       900 FORMAT (1H ,16X,6HXACCEL,9X,6HYACCEL,9X,6HZACCEL,             00001160
                  1 9X,6HXACFIL,9X,6HYACFIL,9X,6HZACFIL /)                       00001170
ISN 0078           NPR = ITTL                                                    00001180
ISN 0079      3020 NPR = NPR+IPL                                                 00001190
ISN 0080           IF(NRP .LE. 0) GO TO 788                                      00001200
ISN 0082           PRINT 700, I,X(I),Y(I),Z(I),PHI(I),THETA(I),PSI(I)            00001210
ISN 0083           PRINT 800, XDOT(I),YDOT(I),ZDOT(I),PHIDOT(I),THEDOT(I),PSIDOT(I)  00001220
ISN 0084           PRINT 800, U(I),V(I),W(I),P(I),Q(I),R(I)                      00001230
ISN 0085           PRINT 800, UDOT(I),VDOT(I),WDOT(I),PDOT(I),QDOT(I),RDOT(I)    00001240
ISN 0086           IF(FCUT.EQ.0.) GO TO 1000                                     00001250
ISN 0088           PRINT 800,XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I)     00001260
ISN 0089           GO TO 1010                                                    00001270
ISN 0090      1000 PRINT 800, XACC(I),YACC(I),ZACC(I)                            00001280
ISN 0091           GO TO 1010                                                    00001290
ISN 0092       788 IF(FCUT.EQ.0.) GO TO 1001                                     00001300
ISN 0094           PRINT 700,I,XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I)   00001310
ISN 0095           GO TO 1010                                                    00001320
ISN 0096      1001 PRINT 700,I, XACC(I),YACC(I),ZACC(I)                          00001330
ISN 0097      1010 PRINT 800                                                     00001340
              C                                                                  00001350
              C    WRITE MASS POINT DATA ON UNIT 1 FOR SUBSEQUENT USE IN PREPLT  00001360
              C                                                                  00001370
ISN 0098           IF(NMEP .EQ. 0) GO TO 7000                                    00001380
ISN 0100           DO 7020 IA=1, NMEP                                            00001390
ISN 0101           IF(I .NE. JMASS(IA,1)) GO TO 7020                             00001400
ISN 0103           WRITE(1) TIME,I,X(I),Y(I),Z(I),XDOT(I),YDOT(I),ZDOT(I),U(I),V(I),  00001410
                  *         W(I),XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I),     00001420
                  *         PHI(I),THETA(I),PSI(I),P(I),Q(I),R(I),PDOT(I),QDOT(I),    00001430
                  *          RDOT(I),XIMP(I),YIMP(I),ZIMP(I)                          00001440
ISN 0104           IF(NPRINT .EQ. 0) NMEW = NMEW + 1                             00001450
ISN 0106           GO TO 7000                                                    00001460
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ISN 0107       7020 CONTINUE
ISN 0108       7000 CONTINUE
              C
              C     PRINT NODE POINT DATA IF THERE IS ANY.
              C
ISN 0109            IF(NNP.EQ.0) GO TO 3099
ISN 0111            DO 4000 JJ=1,NNP
ISN 0112            IF(I.NE.INP(JJ)) GO TO 4000
ISN 0114            IF(NRP .LE. 0) GO TO 2000
ISN 0116            NPR = NPR+5
ISN 0117            PRINT 701,MNP(JJ),XNP(JJ),YNP(JJ),ZNP(JJ)
ISN 0118            PRINT 800,XDNP(JJ),YDNP(JJ),ZDNP(JJ)
ISN 0119            PRINT 800,UNP(JJ),VNP(JJ),WNP(JJ)
ISN 0120            IF(FCUT.EQ.0.) GO TO 1020
ISN 0122            PRINT 800,XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ),
                   1 XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ)
ISN 0123            GO TO 1030
ISN 0124       1020 PRINT 800,XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ)
ISN 0125            GO TO 1030
ISN 0126       2000 NPR = NPR + 2
ISN 0127            IF(FCUT .EQ. 0.0) GO TO 2001
ISN 0129            PRINT 701,MNP(JJ),XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ),
                   1 XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ)
ISN 0130            GO TO 1030
ISN 0131       2001 PRINT 701,MNP(JJ),XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ)
ISN 0132       1030 PRINT 800
              C
              C     WRITE NODE POINT DATA ON UNIT 2 FOR SUBSEQUENT USE IN PREPLT
              C
ISN 0133            IF(NNEP .EQ. 0) GO TO 7001
ISN 0135            IMNP = MNP(JJ)
ISN 0136            DO 7030 IA=1, NNEP
ISN 0137            IF(I .NE. JNODE(IA,2) .OR. IMNP .NE. JNODE(IA,1)) GO TO 7030
ISN 0139            WRITE(2) TIME,I,IMNP,XNP(JJ),YNP(JJ),ZNP(JJ),XDNP(JJ),
                   *         YDNP(JJ),ZDNP(JJ),UNP(JJ),VNP(JJ),WNP(JJ),XACCNP(JJ),
                   *          YACCNP(JJ),ZACCNP(JJ),XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ),
                   *          XIMPNP(JJ),YIMPNP(JJ),ZIMPNP(JJ)
ISN 0140            IF(NPRINT .EQ. 0) NNEW = NNEW + 1
ISN 0142            GO TO 7001
ISN 0143       7030 CONTINUE
ISN 0144       7001 CONTINUE
ISN 0145       4000 CONTINUE
ISN 0146        701 FORMAT(4X,'NODE',I2,1P6E15.5)
ISN 0147        700 FORMAT(1H ,5HMASS ,I2,2X,1P6E15.5)
ISN 0148        800 FORMAT(1H ,9X,1P6E15.5)
ISN 0149       3099 CONTINUE
ISN 0150            IF(NIMP.GT.0) PRINT 3215
ISN 0152            IF(NIMP.LE.0) PRINT 3216
ISN 0154       3215 FORMAT(1X,'MASS IMPULSES(G-SEC)-BASED ON FILTERED ACCELS'//
                   1 16X,8HXIMPULSE,7X,8HYIMPULSE,7X,8HZIMPULSE/)
ISN 0155       3216 FORMAT (//1X,'NO MASS IMPULSE DATA REQUESTED'/)
ISN 0156            IF(NIMP.LE.0) GO TO 3098
ISN 0158            DO 3097 I=1,NM
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ISN 0159          PRINT 700,I,XIMP(I),YIMP(I),ZIMP(I)
ISN 0160          IF(NNP.EQ.0) GO TO 3096
ISN 0162          DO 3096 JJ=1,NNP
ISN 0163          IF(I.NE.INP(JJ)) GO TO 3096
ISN 0165          NPR=NPR+2
ISN 0166          PRINT 701,MNP(JJ),XIMPNP(JJ),YIMPNP(JJ),ZIMPNP(JJ)
ISN 0167     3096 CONTINUE
ISN 0168     3097 CONTINUE
ISN 0169     3098 CONTINUE
ISN 0170          PRINT 3202
ISN 0171     3202 FORMAT(1X,'BEAM FORCES' /)
              C   NSF=OR< 0 NO STRAIN FORCE PRINT
ISN 0172          IF(NSF-0) 3208,3208,3223
ISN 0173     3223 PRINT 3203
ISN 0174     3203 FORMAT(1X,'STRAIN FORCES' /)
ISN 0175          PRINT 830
ISN 0176      830 FORMAT(4X,'I',3X,'J',3X,'M',3X,'N',7X,'FX',11X,'FY',11X,'FZ',11X,
                 1       'MX',11X,'MYI',10X,'MYJ',10X,'MZI',10X,'MZJ')
ISN 0177          PRINT 810,(IG(IJ),JG(IJ),MG(IJ),NG(IJ),(SUMDF(K,IJ),K=1,4),
                 1  SUMDFI(5,IJ),SUMDF(5,IJ),SUMDFI(6,IJ),SUMDF(6,IJ),IJ=1,NB)
              C   NTF=OR<0 NO TOTAL FORCE PRINT
ISN 0178          GO TO 3250
ISN 0179     3208 PRINT 850
ISN 0180      850 FORMAT(/ 1X,'NO STRAIN FORCE PRINT')
ISN 0181     3250 IF(NTF-0)3209,3209,3224
ISN 0182     3224 PRINT 3204
ISN 0183     3204 FORMAT(/ 1X,'TOTAL FORCES (STRAIN+DAMPING)' /)
ISN 0184          PRINT 830
ISN 0185          PRINT 810,(IG(IJ),JG(IJ),MG(IJ),NG(IJ),(FINT(K,IJ),K=1,4),
                 1  FINTI(5,IJ),FINT(5,IJ),FINTI(6,IJ),FINT(6,IJ),IJ=1,NB)
ISN 0186          GO TO 3251
ISN 0187     3209 PRINT 851
ISN 0188      851 FORMAT(/ 1X,'NO TOTAL FORCE PRINT')
ISN 0189     3251 CONTINUE
              C
              C   WRITE BEAM FORCE DATA ON UNIT 3 FOR SUBSEQUENT USE IN PREPLT
              C
ISN 0190          IF(NBFP .EQ. 0) GO TO 7002
ISN 0192          DO 7006 IJ=1, NB
ISN 0193          DO 7040 IA=1, NBFP
ISN 0194          IF(IJ .NE. JBMF(IA,1)) GO TO 7040
ISN 0196          IIG = IG(IJ)
ISN 0197          IJG = JG(IJ)
ISN 0198          IMG = MG(IJ)
ISN 0199          ING = NG(IJ)
ISN 0200          WRITE(3) TIME,IJ,IIG,IJG,IMG,ING,(FINT(K,IJ),K=1,4),FINTI(5,IJ),
                 *        FINT(5,IJ),FINTI(6,IJ),FINT(6,IJ)
ISN 0201          IF(NPRINT .EQ. 0) NBFW = NBFW + 1
ISN 0203          GO TO 7006
ISN 0204     7040 CONTINUE
ISN 0205     7006 CONTINUE
ISN 0206     7002 CONTINUE
ISN 0207          IF(NDE - 0) 3210,3210,3225
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         C     NDE=OR<0 NO DEFL.PRINT
ISN 0208  3225 PRINT 3205
ISN 0209  3205 FORMAT(// 1X,'BEAM RELATIVE DEFLECTIONS AND ROTATIONS AND',
              1           ' BEAM EULER ANGLES (INCHES AND DEGREES)')
ISN 0210       PRINT 3301
ISN 0211  3301 FORMAT(/ 5X,'BEAM',16X,'DEFLECTIONS (J-I)',23X,'ROTATIONS (J-I)',
              1      18X,'ROTATIONS (J+I)',7X,'EULER ANGLES')
ISN 0212       PRINT 3302
ISN 0213  3302 FORMAT(/ 3X,'I',2X,'J',2X,'M',2X,'N',7X,'X',12X,'Y',12X,'Z',
              1      11X,'PHI',9X,'THETA',9X,'PSI',9X,'THETA',9X,'PSI',7X,
              2       'THETA',3X,'PSI')
ISN 0214       DO 3303 IJ=1,NB
ISN 0215       RADEG = 180./3.1415926535
ISN 0216       DO 3304 K=1,3
ISN 0217       TEMP(K) = RADEG*VEE2(K+3,IJ)
ISN 0218       IF(K.GT.2) GO TO 3304
ISN 0220       TEMP(K+3) = RADEG*VEEN(K,IJ)
ISN 0221  3304 CONTINUE
ISN 0222       TEMP(6) = RADEG*THEIJ(IJ)
ISN 0223       TEMP(7) = RADEG*PSIIJ(IJ)
ISN 0224       PRINT 3305,IG(IJ),JG(IJ),MG(IJ),NG(IJ),(VEE2(K,IJ),K=1,3),
              1         (TEMP(K),K=1,7)
ISN 0225  3305 FORMAT(1X,4I3,1P8E13.4,1X,0P2F7.1)
ISN 0226  3303 CONTINUE
ISN 0227   810 FORMAT (1X,4I4,1P8E13.4)
ISN 0228       GO TO 3252
ISN 0229  3210 PRINT 852
ISN 0230   852 FORMAT(/ 1X,'NO BEAM DEFL.PRINT')
ISN 0231  3252 CONTINUE
         C
         C     WRITE BEAM DEFLECTION DATA ON UNIT 4 FOR SUBSEQUENT USE IN PREPLT
         C
ISN 0232       IF(NBDP .EQ. 0) GO TO 7003
ISN 0234       RADEG = 180.0 / 3.1415926535
ISN 0235       DO 7008 IJ=1, NB
ISN 0236       DO 7050 IA=1, NBDP
ISN 0237       IF(IJ .NE. JBMD(IA,1)) GO TO 7050
ISN 0239       DO 7010 K=1, 3
ISN 0240       TEMP(K) = RADEG * VEE2(K+3,IJ)
ISN 0241       IF(K .GT. 2) GO TO 7010
ISN 0243       TEMP(K+3) = RADEG * VEEN(K,IJ)
ISN 0244  7010 CONTINUE
ISN 0245       TEMP(6) = RADEG * THEIJ(IJ)
ISN 0246       TEMP(7) = RADEG * PSIIJ(IJ)
ISN 0247       IIG = IG(IJ)
ISN 0248       IJG = JG(IJ)
ISN 0249       IMG = MG(IJ)
ISN 0250       ING = NG(IJ)
ISN 0251       WRITE(4) TIME,IJ,IIG,IJG,IMG,ING,(VEE2(K,IJ),K=1,3),
              *        (TEMP(K),K=1,5)
ISN 0252       IF(NPRINT .EQ. 0) NBDW = NBDW + 1
ISN 0254       GO TO 7008
ISN 0255  7050 CONTINUE
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ISN 0256      7008 CONTINUE
ISN 0257      7003 CONTINUE
ISN 0258           IF(NSPD - 0) 3211,3211,3226
             C     NSPD=OR<0 NO EXT.SPRING PRINT
ISN 0259      3226 PRINT 3206
ISN 0260      3206 FORMAT(// 1X,'EXTERNAL SPRINGS' /
                  1 57X,'GROUND CONTACT POINT LOADS',13X,'GROUND CONTACT POINT LOADS'
                  2  / 59X,'IN GROUND OR SLOPE AXES',21X,'IN MASS AXES' /
                  3 41X,'SPRING' / 1X,'MASS SPRING  SPRING',8X,'GROUND',4X,
                  4 'COMPRESSION',2X,'X(+ AFT OR',4X,'Y(+ LEFT) Z(+ UP OR NOR-',6X,
                  5 'X',13X,'Y',12X,'Z' / 3X,'I  K  M  COMPRESSION',3X,
                  6 'DEFLECTION',5X,
                  7 'LOAD',6X,'DOWN SLOPE)',13X,'MAL TO SLOPE)',2X,'(+ FORWARD)',
                  8 3X,'(+ RIGHT)',5X,'(+ DOWN)' /)
ISN 0261           GO TO 3228
ISN 0262      3211 PRINT 853
ISN 0263       853 FORMAT(/ 1X,'NO EXTERNAL SPRINC PRINT')
ISN 0264           GO TO 3227
ISN 0265      3228 DO 3040 IKM=1,NSP
ISN 0266           SCNET = SC(IKM)-DELG(IKM)
ISN 0267           PRINT 820,II(IKM),KK(IKM),MM(IKM),SCNET,DELG(IKM),
                  1 (FSPRNG(IKM,J),J=1,7)
ISN 0268       820 FORMAT(1X,3I3,1P9E13.5)
ISN 0269      3040 CONTINUE
ISN 0270      3227 CONTINUE
             C
             C     WRITE EXTERNAL SPRING DATA ON UNIT 8 FOR SUBSEQUENT USE IN PREPLT
             C
ISN 0271           IF(NSEP .EQ. 0) GO TO 7004
ISN 0273           DO 7060 IA=1, NSEP
ISN 0274           DO 7009 IKM=1, NSP
ISN 0275           IF(II(IKM) .NE. JSPR(IA,1) .OR. MM(IKM) .NE. JSPR(IA,2))
                  *   GO TO 7009
ISN 0277          •III = II(IKM)
ISN 0278           IKK = KK(IKM)
ISN 0279           IMM = MM(IKM)
ISN 0280           WRITE(8) TIME,III,IKK,IMM,SC(IKM),FSPRNG(IKM,1)
ISN 0281           IF(NPRINT .EQ. 0) NSEW = NSEW + 1
ISN 0283      7009 CONTINUE
ISN 0284      7060 CONTINUE
ISN 0285      7004 CONTINUE
ISN 0286           IF(NDRI .EQ. 0) GO TO 3076
ISN 0288           PRINT 3207
ISN 0289      3207 FORMAT(/ 1X,'DRI RESULTS: MASS NO. AND DRI VALUE')
ISN 0290           PRINT 821
ISN 0291       821 FORMAT(1H //1X,'MASS',7X,'DRI')
ISN 0292           DO 3070 I = 1,NB
ISN 0293           IF(IJPR(I).EQ.0) GO TO 3070
ISN 0295      3065 PRINT 822, JG(I),DRI(I)
             C
             C     WRITE BEAM DRI DATA ON UNIT 9 FOR SUBSEQUENT USE IN PREPLT
             C
ISN 0296           IF(NDRP .EQ. 0) GO TO 7005
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ISN 0298          IJG = JG(I)
ISN 0299          DO 7070 IA=1, NDRP
ISN 0300          IF(IJG .NE. JDRI(IA)) GO TO 7070
ISN 0302          WRITE(9) TIME,IJG,DRI(I)
ISN 0303          IF(NPRINT .EQ. 0) NDRW = NDRW + 1
ISN 0305          GO TO 7005
ISN 0306     7070 CONTINUE
ISN 0307     7005 CONTINUE
ISN 0308     3070 CONTINUE
ISN 0309     3076 PRINT 3075,XDOTAP,YDOTAP,ZDOTAP
ISN 0310     3075 FORMAT(/ 1X,'VEHICLE C.G. TRANSLATIONAL VELOCITIES, GROUND AXES, B
                 1ASED ON SYSTEM LINEAR MOMENTUM' // 11X,'XDOT',10X,'YDOT',12X,'ZDOT
                 2' / 10X,'(+FWD)',7X,'(+RIGHT)',8X,'(+DOWN)' / 4X,1P3E15.5)
                C
                C         WRITE VEHICLE C.G. VELOCITY DATA ON UNIT 10 FOR SUBSEQUENT USE IN
                C         PREPLT
                C
ISN 0311          WRITE(10) TIME,XDOTAP,YDOTAP,ZDOTAP
                C
ISN 0312          IF(NVCH .LE. 0) GO TO 3074
ISN 0314          PRINT 3071
ISN 0315     3071 FORMAT(// 1X,'VOLUME CHANGE DATA' // 48X,'VOLUME LENGTH CHANGES'
                 1/ 1X,'VOL. NO.',5X,'VOL.',8X,'VOL./VZERO',8X,'DX',13X,'DY',13X,
                 2'DZ' /)
ISN 0316          DO 3073 I=1,NVCH
ISN 0317          VOV = VOL(I)/VZERO(I)
ISN 0318          PRINT 3072,I,VOL(I),VOV,(DLVOL(I,J),J=1,3)
ISN 0319     3073 CONTINUE
ISN 0320     3072 FORMAT(1X,I6,1P5E15.5)
ISN 0321      822 FORMAT(1H ,1X,I2,3X,1PE15.5)
ISN 0322     3074 SUMKEI = 0.0
ISN 0323          SUMPEI = 0.0
ISN 0324          SUMSEI = 0.0
ISN 0325          SUMDEI = 0.0
ISN 0326          SUMCEI = 0.0
ISN 0327          SUMFEI = 0.
ISN 0328          DO 3400 I = 1,NM
ISN 0329          SUMPEI = SUMPEI+PEI(I)
ISN 0330          SUMKEI = SUMKEI+KEI(I)
ISN 0331     3400 CONTINUE
ISN 0332          DO 3406 IJ = 1,NB
ISN 0333          SUMSEI = SUMSEI+SEIJ(IJ)
ISN 0334     3406 SUMDEI = SUMDEI+DEIJ(IJ)
                C         WRITE BEAM STRAIN&DAMPING ENERGY DATA ON UNIT 11 FOR USE IN PREPLT
ISN 0335          DO 7200 IJ=1,NB
ISN 0336          IF(TIME.EQ.0.) GO TO 9003
ISN 0338          PCSE=(SEIJ(IJ)/SUMSEI)*100.
ISN 0339          PCDE=(DEIJ(IJ)/SUMDEI)*100.
ISN 0340          GO TO 9004
ISN 0341     9003 SEIJ(IJ)=0.
ISN 0342          DEIJ(IJ)=0.
ISN 0343          PCSE=0.
ISN 0344          PCDE=0.
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ISN 0345      9004 DO 7201 IA=1,NENP                                             00004120
ISN 0346           IF(IJ.NE.JENG(IA,1)) GO TO 7201                               00004130
ISN 0348           IIG=IG(IJ)                                                    00004140
ISN 0349           IJG=JG(IJ)                                                    00004150
ISN 0350           IMG=MG(IJ)                                                    00004160
ISN 0351           ING=NG(IJ)                                                    00004170
ISN 0352           WRITE(11) TIME,IJ,IIG,IMG,IJG,ING,SEIJ(IJ),PCSE,DEIJ(IJ),PCDE  00004180
ISN 0353           IF(NPRINT.EQ.0) NENW=NENW+1                                   00004190
ISN 0355           GO TO 7200                                                    00004200
ISN 0356      7201 CONTINUE                                                      00004210
ISN 0357      7200 CONTINUE                                                      00004220
ISN 0358           IF(NSP.EQ.0) GO TO 3409                                       00004230
ISN 0360           DO 3407 IKM=1,NSP                                             00004240
ISN 0361           SUMFEI = SUMFEI+CEIKF(IKM)                                    00004250
ISN 0362      3407 SUMCEI = SUMCEI+CEIK(IKM)                                     00004260
ISN 0363      3409 ETOT = SUMKEI+SUMPEI+SUMSEI+SUMDEI+SUMCEI+SUMFEI              00004270
ISN 0364           IF(TIME.EQ.0.0) ETOTTO = ETOT                                 00004280
ISN 0366           ETOTR=ETOT/ETOTTO                                             00004290
ISN 0367           XTOL1=NTOL1/100.                                              00004300
ISN 0368           IF((DABS(ETOTR)-1.).LE. XTOL1) GO TO 3770                     00004310
ISN 0370           IEER=1                                                        00004320
ISN 0371           IETOT=1                                                       00004330
ISN 0372      3770 IF(INGSCT.EQ.200) GO TO 3414                                  00004340
ISN 0374           INGSCT = INGSCT+1                                             00004350
ISN 0375           ETIME(INGSCT) = TIME                                          00004360
ISN 0376           DEV(INGSCT)   = DEVMAX                                        00004370
ISN 0377           ENGSMY(1,INGSCT) = SUMKEI                                     00004380
ISN 0378           ENGSMY(2,INGSCT) = SUMPEI                                     00004390
ISN 0379           ENGSMY(3,INGSCT) = SUMSEI                                     00004400
ISN 0380           ENGSMY(4,INGSCT) = SUMDEI                                     00004410
ISN 0381           ENGSMY(5,INGSCT) = SUMCEI                                     00004420
ISN 0382           ENGSMY(6,INGSCT) = SUMFEI                                     00004430
ISN 0383      3414 CONTINUE                                                      00004440
ISN 0384           PRINT 3405                                                    00004450
ISN 0385      3405 FORMAT(// 1X,'ENERGY DISTRIBUTION' //)                        00004460
ISN 0386           PRINT 3401                                                    00004470
ISN 0387      3401 FORMAT(1H0,6X,'TOTAL',7X,'KINETIC',6X,'POTENTIAL',7X,'STRAIN',7X, 00004480
                  1 'DAMPING',7X,'CRUSHING',6X,'FRICTION' / 6X,'ENERGY',         00004490
                  2 6(8X,'ENERGY') /)                                            00004500
ISN 0388           PRINT 3402, ETOT,SUMKEI,SUMPEI,SUMSEI,SUMDEI,SUMCEI,SUMFEI    00004510
ISN 0389      3402 FORMAT(1X,1P7E14.5)                                           00004520
ISN 0390           PCKE = SUMKEI/ETOT                                            00004530
ISN 0391           PCPE = SUMPEI/ETOT                                            00004540
ISN 0392           PCSE = SUMSEI/ETOT                                            00004550
ISN 0393           PCDE = SUMDEI/ETOT                                            00004560
ISN 0394           PCCE = SUMCEI/ETOT                                            00004570
ISN 0395           PCFE = SUMFEI/ETOT                                            00004580
ISN 0396           PRINT 3403, PCKE,PCPE,PCSE,PCDE,PCCE,PCFE                     00004590
ISN 0397      3403 FORMAT('0  PERCENT OF',2P6F14.3/3X,'TOTAL ENERGY')            00004600
ISN 0398           IF(NED-0) 3601,3601,3229                                      00004610
             C     NED=<0. NO INDIVIDUAL ENERGY TERMS PRINTED                    00004620
ISN 0399      3229 PRINT 3404                                                    00004630
ISN 0400      3404 FORMAT(// 63X,'INTERNAL',38X,'EXTERNAL' /                     00004640
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                    1 45X,'BEAM',41X,'SPRING' / 7X,'KINETIC',9X,
                    2 'POTENTIAL',25X,'STRAIN',11X,'DAMPING',17X,'CRUSHING',9X,
                    3 'FRICTION' / 1X,'MASS',2X,'ENERGY',5X,'PCT',3X,'ENERGY',5X,
                    4 'PCT',2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',3X,'ENERGY',5X,'PCT',
                    5 3X,'ENERGY',5X,'PCT',3X,'I',1X,'K',1X,'M',3X,'ENERGY',5X,'PCT',
                    6 3X,'ENERGY',5X,'PCT' /)
ISN 0401      3601 XTOL2=NTOL2/100.
ISN 0402           XTOL3=NTOL3
ISN 0403           MAXEN = MAX0(NM,NB,NSP)
ISN 0404           IF(TIME.EQ.0.0) MAXEN = NM
ISN 0406           DO 3410 IO = 1,MAXEN
ISN 0407           IOPTR = 0
ISN 0408           IF(IO.GT.NM) GO TO 3411
ISN 0410           IOPTR = IOPTR+4
ISN 0411           IF(SUMKEI.NE.0.) GO TO 5000
ISN 0413           PCKE = 0.
ISN 0414           GO TO 5001
ISN 0415      5000 PCKE = KEI(IO)/SUMKEI
ISN 0416      5001 IF(SUMPEI.NE.0.) GO TO 5002
ISN 0418           PCPE = 0.
ISN 0419           GO TO 5003
ISN 0420      5002 PCPE = PEI(IO)/SUMPEI
ISN 0421      5003 IF(TIME.EQ.0.0) GO TO 3504
ISN 0423      3411 IF(IO.GT.NB)  GO TO 3412
ISN 0425           IOPTR = IOPTR+2
ISN 0426           IF (SUMSEI .EQ. 0) GO TO 3415
ISN 0428           PCSE = SEIJ(IO)/SUMSEI
ISN 0429           IF(SUMSEI.GE.0.) GO TO 3700
ISN 0431           IESE=1
ISN 0432           IEER=1
ISN 0433      3700 IF(SEIJ(IO).GE.0. .OR. DABS(SEIJ(IO)).LE.DABS(SUMSEI*XTOL2))
                  1 GO TO 3710
ISN 0435           IEPSE=1
ISN 0436           IEER=1
ISN 0437      3710 GO TO 3416
ISN 0438      3415 PCSE = 0.
ISN 0439      3416 IF (SUMDEI .EQ. 0.) GO TO 3417
ISN 0441           PCDE = DEIJ(IO)/SUMDEI
ISN 0442           IF(SUMDEI.GE.0.) GO TO 3720
ISN 0444           IEDE=1
ISN 0445           IEER=1
ISN 0446      3720 IF(DEIJ(IO).GE.0. .OR.DABS(DEIJ(IO)).LE.DABS(SUMDEI*XTOL2))
                  1 GO TO 3730
ISN 0448           IEPDE=1
ISN 0449           IEER=1
ISN 0450      3730 GO TO 3412
ISN 0451      3417 PCDE = 0.
ISN 0452      3412 IF(IO.GT.NSP) GO TO 3418
ISN 0454           IOPTR = IOPTR+1
ISN 0455           I = II(IO)
ISN 0456           K = KK(IO)
ISN 0457           M = MM(IO)
ISN 0458           CE = CEIK(IO)
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ISN 0459         IF(SUMCEI.NE.0.) GC TO 5010
ISN 0461         PCCE = 0.
ISN 0462         GO TO 5011
ISN 0463    5010 FCCE = CE/SUMCEI
ISN 0464         IF(SUMCEI.GE.0.) GO TO 3740
ISN 0466         IECE=1
ISN 0467         IEER=1
ISN 0468    3740 IF(CEIKF(IO).GE.0. .OR. DABS(CEIKF(IO)).LE.DABS(SUMCEI*XTOL2))
               1 GO TO 5011
ISN 0470         IEPCE=1
ISN 0471         IEER=1
ISN 0472    5011 FE = CEIKF(IO)
ISN 0473         IF(SUMFEI.NE.0.) GO TO 5012
ISN 0475         PCFE = 0.
ISN 0476         GO TO 3418
ISN 0477    5012 PCFE = FE/SUMFEI
ISN 0478         IF(SUMFEI.GE.0.) GO TO 3750
ISN 0480         IEFE=1
ISN 0481         IEER=1
ISN 0482    3750 IF(CEIKF(IO).GE.0. .OR.DABS(CEIKF(IO)).LE.DABS(SUMFEI*XTOL2))
               1 GO TO 3418
ISN 0484         IEPFE=1
ISN 0485         IEER=1
ISN 0486    3418 IF(NED-0) 3410,3410,3413
ISN 0487    3413 GO TO (3501,3502,3503,3504,3505,3506,3507), IOPTR
           C*****ONLY CE
ISN 0488    3501 PRINT 3511,I,K,M,CE,PCCE,FE,PCFE
ISN 0489    3511 FORMAT(88X,I4,2I2,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0490         GO TO 3410
           C*****SE AND DE
ISN 0491    3502 PRINT 3512,IO,IG(IO),JG(IO),MG(IO),NG(IO),SEIJ(IO),PCSE,DEIJ(IO),
               1 PCDE
ISN 0492    3512 FORMAT(39X,5I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0493         GO TO 3410
           C*****SE, DE, CE
ISN 0494    3503 PRINT 3513,IO,IG(IO),JG(IO),MG(IO),NG(IO),
               1 SEIJ(IO),PCSE,DEIJ(IO),PCDE,I,K,M,CE,
               2 PCCE,FE,PCFE
ISN 0495    3513 FORMAT(39X,5I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,I4,2I2,1PE11.3,
               1 2PF6.1,1PE11.3,2PF6.1)
ISN 0496         GO TO 3410
           C*****KE AND PE
ISN 0497    3504 PRINT 3514,IO,KEI(IO),PCKE,PEI(IO),PCPE
ISN 0498    3514 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0499         GO TO 3410
           C*****KE, PE, CE
ISN 0500    3505 PRINT 3515,IO,KEI(IO),PCKE,PEI(IO),PCPE,I,K,M,CE,PCCE,FE,PCFE
ISN 0501    3515 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,50X,I4,2I2,
               1 1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0502         GO TO 3410
           C*****KE, PE, SE, DE
ISN 0503    3506 PRINT 3516,IO,KEI(IO),PCKE,PEI(IO),PCPE,IO,IG(IO),JG(IO),
               1 MG(IO),NG(IO),SEIJ(IO),
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                  2 PCSE,DEIJ(IO),PCDE
ISN 0504     3516 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,1X,5I3,
                  1 1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0505          GO TO 3410
             C*****KE, PE, SE, DE, CE
ISN 0506     3507 PRINT 3517,IO,KEI(IO),PCKE,PEI(IO),PCPE,IO,IG(IO),JG(IO),
                  1 MG(IO),NG(IO),SEIJ(IO),
                  2 PCSE,DEIJ(IO),PCDE,I,K,M,CE,PCCE,FE,PCFE
ISN 0507     3517 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,1X,5I3,1PE11.3,2PF6.1,
                  1 1PE11.3,2PF6.1,I4,2I2,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0508     3410 CONTINUE
ISN 0509          PRINT 8000
ISN 0510     8000 FORMAT(// 1X,'DEVIATION OF TOTAL ENERGY OF EACH MASS FROM ',
                  1           '100 PERCENT')
ISN 0511          PRINT 8002
ISN 0512     8002 FORMAT(// 1X,'MASS',2X,'DEVIATION(PERCENT)' /)
ISN 0513          DO 8004 I=1,NM
ISN 0514          DEVIAT = XPCT(I)-100.
ISN 0515          IF(DABS(DEVIAT).LE.XTOL3) GO TO 3760
ISN 0517          IEDEV=1
ISN 0518          IEER=1
ISN 0519     3760 IF(XPCT(I).EQ.0) DEVIAT=0.
ISN 0521          PRINT 8006,I,DEVIAT
ISN 0522     8004 CONTINUE
ISN 0523     8006 FORMAT(1X,I3,4X,F12.6)
ISN 0524          IF(NED-0) 3212,3212,3602
ISN 0525     3602 GO TO 3230
ISN 0526     3212 PRINT 854
ISN 0527      854 FORMAT (/ 1X,'NO ENERGY TERMS PRINTED')
ISN 0528     3230 IF(NS-0) 3213,3213,3231
             C    NS EQ OR LESS THAN 0   NO STRESSES ARE PRINTED
ISN 0529     3231 PRINT 3510
ISN 0530     3510 FORMAT(// 1X,'ELEMENT STRESSES')
ISN 0531          PRINT 3519
ISN 0532     3519 FORMAT(// 39X,'RATIO OF CURRENT STRESS / FAILURE STRESS',31X,
                  1 'RATIO OF CURRENT' / 8X,'BEAM',12X,'MAXIMUM SHEAR STRESS THEORY',
                  * 9X,'THEORY OF CONSTANT ENERGY OF DISTORTION',6X,'AXIAL/FAILURE',
                  * 5X,'BUCK. /' / 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'TOP',5X,
                  * 'BOTTOM',6X,'LEFT',5X,'RIGHT',8X,'TOP',5X,'BOTTOM',6X,'LEFT',5X,
                  * 'RIGHT',7X,'COMPR.   TENSILE   CR.BUCK.' / 104X,'STRESS   STRESS'
                  * ,6X,'LOAD' /)
ISN 0533          DO 3520 IJ=1,NB
ISN 0534          I = IG(IJ)
ISN 0535          J = JG(IJ)
ISN 0536          M = MG(IJ)
ISN 0537          N = NG(IJ)
ISN 0538          IF(SBUCKR(IJ) .GT. 0.0) GO TO 3521
ISN 0540          BLOAD = DABS(SBUCKR(IJ))
ISN 0541          IF(AA(IJ) .EQ. 0.0) GO TO 3525
ISN 0543          SAXL = BLOAD * PCR(IJ) / (AA(IJ) * SCOMP(MC(IJ)))
ISN 0544          GO TO 3526
ISN 0545     3525 SAXL = 0.0
ISN 0546     3526 PRINT 3518, IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),(FRD(IJ,IT),IT=1,4),
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                   *           SAXL,BLOAD                                          00006240
ISN 0547      3518 FORMAT(1X,5I3,1X,1P4E10.3,2X,4E10.3,2X,E10.3,10X,E10.3)     00006250
ISN 0548           GO TO 3520                                                  00006260
ISN 0549      3521 CONTINUE                                                    00006270
ISN 0550           BLOAD = 0.0                                                 00006280
ISN 0551           IF(AA(IJ) .EQ. 0.0) GO TO 3522                              00006290
ISN 0553           SAXL = SBUCKR(IJ) * PCR(IJ) / (STENS(MC(IJ)) * AA(IJ))      00006300
ISN 0554           GO TO 3523                                                  00006310
ISN 0555      3522 SBUCK = 0.0                                                 00006320
ISN 0556      3523 PRINT 3524, IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),(FRD(IJ,IT),IT=1,4),  00006330
                   *           SAXL                                            00006340
ISN 0557      3524 FORMAT(1X,5I3,1X,1P4E10.3,2X,4E10.3,12X,E10.3)              00006350
ISN 0558      3520 CONTINUE                                                    00006360
ISN 0559           GO TO 3232                                                  00006370
ISN 0560      3213 PRINT 855                                                   00006380
ISN 0561       855 FORMAT(/ 1X,'NO STRESS PRINT')                              00006390
              C                                                                00006400
              C    WRITE BEAM ELEMENT STRESS DATA ON UNIT 13 FOR SUBSEQUENT USE IN  00006410
              C    PREPLT                                                      00006420
              C                                                                00006430
ISN 0562      3232 IF(NSTP .EQ. 0) GO TO 7100                                  00006440
ISN 0564           DO 7110 IJ=1, NB                                            00006450
ISN 0565           DO 7080 IA=1, NSTP                                          00006460
ISN 0566           IF(IJ .NE. JBMS(IA,1)) GO TO 7080                           00006470
ISN 0568           I = IG(IJ)                                                  00006480
ISN 0569           J = JG(IJ)                                                  00006490
ISN 0570           M = MG(IJ)                                                  00006500
ISN 0571           N = NG(IJ)                                                  00006510
ISN 0572           BLOAD = SBUCKR(IJ)                                          00006520
ISN 0573           IF(BLOAD .GT. 0.0) BLOAD = 0.0                              00006530
ISN 0575           IF(AA(IJ) .EQ. 0.0) GO TO 3527                              00006540
ISN 0577           IF(SBUCKR(IJ) .GT. 0.0) GO TO 3528                          00006550
ISN 0579           SAXL = SBUCKR(IJ) * PCR(IJ) / (AA(IJ) * SCOMP(MC(IJ)))      00006560
ISN 0580           GO TO 3529                                                  00006570
ISN 0581      3528 SAXL = SBUCKR(IJ) * PCR(IJ) / (AA(IJ) * STENS(MC(IJ)))      00006580
ISN 0582           GO TO 3529                                                  00006590
ISN 0583      3527 SAXL = 0.0                                                  00006600
ISN 0584      3529 CONTINUE                                                    00006610
ISN 0585           WRITE(13) TIME,IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),              00006620
                   *           (FRD(IJ,IT),IT=1,4),SAXL,BLOAD                  00006630
ISN 0586           IF(NPRINT .EQ. 0) NSTW = NSTW + 1                           00006640
ISN 0588           GO TO 7110                                                  00006650
ISN 0589      7080 CONTINUE                                                    00006660
ISN 0590      7110 CONTINUE                                                    00006670
ISN 0591      7100 CONTINUE                                                    00006680
ISN 0592           IF(NPLT.EQ.0) GO TO 100                                     00006690
ISN 0594           IPFCT = IPFCT + 1                                           00006700
ISN 0595           IF(IPFCT .EQ. 0 .OR. IPFCT .EQ. NPFCT) GO TO 170            00006710
ISN 0597           GO TO 100                                                   00006720
ISN 0598       170 CONTINUE                                                    00006730
ISN 0599           IPFCT = 0                                                   00006740
ISN 0600           DO 110 IP=1,NPLT                                            00006750
ISN 0601           NJ=NMPTS(IP)                                                00006760
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ISN 0602          DO 160 IJ=1,NJ                                          00006770
ISN 0603          DO 120 IM=1,NM                                          00006780
ISN 0604          IF(IM .NE. MNUM(IJ,IP)) GO TO 120                       00006790
ISN 0606          J=ITPL(IP)                                              00006800
ISN 0607          GO TO (130,140,150),J                                   00006810
ISN 0608      130 A(IJ)= -X(IM)                                           00006820
ISN 0609          B(IJ)=Y(IM)                                             00006830
ISN 0610          IFIRST = 1                                              00006840
ISN 0611          ILAST = 5                                               00006850
ISN 0612          GO TO 160                                               00006860
ISN 0613      140 A(IJ)= -X(IM)                                           00006870
ISN 0614          B(IJ) = -Z(IM)                                          00006880
ISN 0615          IFIRST = 6                                              00006890
ISN 0616          ILAST = 10                                              00006900
ISN 0617          GO TO 160                                               00006910
ISN 0618      150 A(IJ)=Y(IM)                                             00006920
ISN 0619          B(IJ) = -Z(IM)                                          00006930
ISN 0620          IFIRST = 11                                             00006940
ISN 0621          ILAST = 15                                              00006950
ISN 0622          GO TO 160                                               00006960
ISN 0623      120 CONTINUE                                                00006970
ISN 0624      160 CONTINUE                                                00006980
ISN 0625          PRINT 7120, (IPLN(IJ), IJ=IFIRST, ILAST)                00006990
ISN 0626     7120 FORMAT(1H1,51X,'MASS POSITION PLOT PLANE ** ',5A4 / 20X, 00007000
                *        'NOTE *** A MODIFIED RIGHT HAND GROUND COORDINATE', 00007010
                *        ' SYSTEM HAS BEEN USED FOR THIS PLOT ***' / )     00007020
ISN 0627          PRINT 7130                                              00007030
ISN 0628     7130 FORMAT(4(7X,'MASS   HORIZ   VERTICAL') /                00007040
                1 4(8X,'NO      AXIS        AXIS ') / )                   00007050
ISN 0629          PRINT 7140, (MNUM(IJ,IP),A(IJ),B(IJ),IJ=1,NJ)           00007060
ISN 0630     7140 FORMAT(4(8X,I2,F10.2,F10.2))                            00007070
ISN 0631          PRINT 7150                                              00007080
ISN 0632     7150 FORMAT(1X)                                              00007090
ISN 0633          IF(NJ .LE. 12) GO TO 180                                00007100
ISN 0635          PRINT 7120, IPLN(ITPL(IP))                              00007110
ISN 0636      180 CALL PAPLOT(A,B,XSCALE(IP),YSCALE(IP),MNUM(1,IP),NMPTS(IP), 00007120
                *            ISCALE(IP))                                  00007130
ISN 0637      110 CONTINUE                                                00007140
ISN 0638          PRINT 7160                                              00007150
ISN 0639     7160 FORMAT(1H1,1X)                                          00007160
ISN 0640      100 CONTINUE                                                00007170
ISN 0641          RETURN                                                  00007180
ISN 0642          END                                                     00007190
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     *                                                                                                  *
     *                                                                                                  *
     *                  LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                    *
     *                                                                                                  *
     ****************************************************************************************************

        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                          SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                C        DATA SET D2334RC     AT LEVEL 003 AS OF 06/25/79
                C        DATA SET D2332NRC    AT LEVEL 004 AS OF 12/01/77                00000010
                C        DATA SET D2332NRC    AT LEVEL 002 AS OF 11/04/77                00000020
                C        DATA SET D2332SRC    AT LEVEL 001 AS OF 07/29/77                00000030
  ISN 0002            SUBROUTINE RC                                                      00000040
                C                                                                        00000050
  ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                          00000060
  ISN 0004            REAL*8 KUN                                                         00000070
  ISN 0005            REAL*4 CLTEST                                                      00000080
  ISN 0006            INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                        00000090
  ISN 0007            INTEGER*4 TITLE(40)                                                00000100
  ISN 0008            INTEGER*2 N1,NN                                                    00000110
  ISN 0009            INTEGER*2 INBUFF                                                   00000120
  ISN 0010            INTEGER*2 IJPR,IG,JG                                               00000130
  ISN 0011            INTEGER*2 MG(150),NG(150),INP(50),MNP(50)                          00000140
  ISN 0012            DIMENSION AIDP(3,3)                                                00000150
  ISN 0013            DIMENSION XK3(6,6,150),YZMIN(150)                                  00000160
  ISN 0014            DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)       00000170
  ISN 0015            DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)       00000180
  ISN 0016            DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)00000190
  ISN 0017            DIMENSION IMDRI(80)                                                00000200
  ISN 0018            COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),            00000210
                     1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),     00000220
                     2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                      00000230
  ISN 0019            COMMON/CFIC/ SINBET,COSBET,ABETA(9)                                00000240
  ISN 0020            COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),        00000250
                     1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)          00000260
  ISN 0021            COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                  00000270
                     1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,               00000280
                     2 XGDOT,YGDOT,ZGDOT                                                 00000290
  ISN 0022            COMMON/INIDCP/ YDP(80)                                             00000300
  ISN 0023            COMMON/INCFIC/ BETA                                                00000310
  ISN 0024            COMMON/MCFIII/ SYMFLG                                              00000320
  ISN 0025            COMMON/NP00I2/ MG,NG,INP,MNP                                       00000330
  ISN 0026            COMMON/NP00I4/ NNP                                                 00000340
  ISN 0027            COMMON/NP00R8/ RX,RY,RZ                                            00000350
  ISN 0028            COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,             00000360
                     1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                         00000370
  ISN 0029            COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                   00000380
  ISN 0030            COMMON/DEIC/ WTOT,CLTEST(150)                                      00000390
  ISN 0031            COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000400
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                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                 A CEIKF(40),
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                 C NM,NB,I,J,IG(150),JG(150),
                 D N1(900),NN(40),IJPR(150)
ISN 0032           COMMON/IPIC/ NIC
ISN 0033           EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0034           SIN(X) = DSIN(X)
ISN 0035           COS(X) = DCOS(X)
ISN 0036           SQRT(X) = DSQRT(X)
ISN 0037           ARSIN(X) = DARSIN(X)
ISN 0038           ATAN2(Y,X) = DATAN2(Y,X)
ISN 0039           AMIN1(X,Y) = DMIN1(X,Y)
ISN 0040           WTOT = 0.0
ISN 0041           PI = 3.14159265358979324D0
ISN 0042           PI2 = PI/2.
ISN 0043           PIN = -PI
ISN 0044           PI2N = -PI2
ISN 0045           BETAR = BETA*PI/180.
ISN 0046           SINBET = DSIN(BETAR)
ISN 0047           COSBET = DCOS(BETAR)
ISN 0048           ABETA(1) = COSBET
ISN 0049           ABETA(2) = 0.
ISN 0050           ABETA(3) =-SINBET
ISN 0051           ABETA(4) = 0.
ISN 0052           ABETA(5) = 1.
ISN 0053           ABETA(6) = 0.
ISN 0054           ABETA(7) = SINBET
ISN 0055           ABETA(8) = 0.
ISN 0056           ABETA(9) = COSBET
ISN 0057           KMATR(1,1) = 3
ISN 0058           KMATR(1,2) = 4
ISN 0059           KMATR(1,3) = 7
ISN 0060           KMATR(1,4) = 8
ISN 0061           KMATR(2,1) = 1
ISN 0062           KMATR(2,2) = 2
ISN 0063           KMATR(2,3) = 5
ISN 0064           KMATR(2,4) = 6
ISN 0065           KMATR(3,1) = 1
ISN 0066           KMATR(3,2) = 3
ISN 0067           KMATR(3,3) = 5
ISN 0068           KMATR(3,4) = 7
ISN 0069           KMATR(4,1) = 2
ISN 0070           KMATR(4,2) = 4
ISN 0071           KMATR(4,3) = 6
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ISN 0072          KMATR(4,4) = 8                                          00000940
ISN 0073          KMATR(5,1) = 1                                          00000950
ISN 0074          KMATR(5,2) = 2                                          00000960
ISN 0075          KMATR(5,3) = 3                                          00000970
ISN 0076          KMATR(5,4) = 4                                          00000980
ISN 0077          KMATR(6,1) = 5                                          00000990
ISN 0078          KMATR(6,2) = 6                                          00001000
ISN 0079          KMATR(6,3) = 7                                          00001010
ISN 0080          KMATR(6,4) = 8                                          00001020
ISN 0081          PRINT 2001                                              00001030
ISN 0082     2001 FORMAT(1H1 / 1X,'MODEL PARAMETERS')                     00001040
ISN 0083          DO 2006 I=1,NM                                          00001050
ISN 0084          IMDRI(I) = 0                                            00001060
ISN 0085     2006 CONTINUE                                                00001070
ISN 0086          DO 2004 IJ=1,NB                                         00001080
ISN 0087          IF(IJPR(IJ).NE.0) IMDRI(JG(IJ))=1                       00001090
ISN 0089     2004 CONTINUE                                                00001100
ISN 0090          DO 2010 I = 1,NM                                        00001110
ISN 0091          IF(IMDRI(I).NE.0) GO TO 2010                            00001120
ISN 0093          WTOT = WTOT+WGT(I)                                      00001130
            C                                                             00001140
            C     FOR SYMMETRICAL MODEL,ADD CONTRIBUTIONS FROM OTHER SIDE. 00001150
            C                                                             00001160
ISN 0094          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2010              00001170
ISN 0096          WTOT = WTOT+WGT(I)                                      00001180
ISN 0097     2010 CONTINUE                                                00001190
ISN 0098          PRINT 2011,WTOT                                         00001200
ISN 0099     2011 FORMAT(/ 1X,'VEHICLE WT = ',1PE12.6)                    00001210
ISN 0100          XGDP = 0.0                                              00001220
ISN 0101          YGDP = 0.0                                              00001230
ISN 0102          ZGDP = 0.0                                              00001240
ISN 0103          DO 2020 I = 1,NM                                        00001250
ISN 0104          IF(IMDRI(I).NE.0) GO TO 2020                            00001260
ISN 0106          XGDP = XGDP+WGT(I)*XDP(I)                               00001270
ISN 0107          YGDP = YGDP+WGT(I)*YDP(I)                               00001280
ISN 0108          ZGDP = ZGDP+WGT(I)*ZDP(I)                               00001290
ISN 0109          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020              00001300
ISN 0111          XGDP = XGDP+WGT(I)*XDP(I)                               00001310
ISN 0112          YGDP = YGDP-WGT(I)*YDP(I)                               00001320
ISN 0113          ZGDP = ZGDP+WGT(I)*ZDP(I)                               00001330
ISN 0114     2020 CONTINUE                                                00001340
ISN 0115          XGDP = XGDP/WTOT                                        00001350
ISN 0116          YGDP = YGDP/WTOT                                        00001360
ISN 0117          ZGDP = ZGDP/WTOT                                        00001370
ISN 0118          PRINT 2013                                              00001380
ISN 0119     2013 FORMAT(/ 1X,'VEHICLE CG POSITION')                      00001390
ISN 0120          PRINT 2012,XGDP,YGDP,ZGDP                               00001400
ISN 0121     2012 FORMAT(1X,'X (FS) = ',1PE12.5 /                         00001410
                1        1X,'Y (BL) = ',1PE12.5 /                         00001420
                1        1X,'Z (WL) = ',1PE12.5)                          00001430
            C                                                             00001440
            C     CALCULATE VECTOR COMPONENTS FROM MASS I TO NODE POINT M 00001450
            C     FOR ALL NNP NODE POINTS.                                00001460
```

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                C
ISN 0122              IF(NNP.EQ.0) GO TO 2051
ISN 0124              DO 3000 JJ=1,NNP
ISN 0125              I = INP(JJ)
ISN 0126              T1 = XDP(I)-XNPDP(JJ)
ISN 0127              T2 = YDP(I)-YNPDP(JJ)
ISN 0128              T3 = ZDP(I)-ZNPDP(JJ)
                C
                C  THESE ARE IN (-) AIRPLANE AXES.  CONVERT TO BODY AXES BY
                C  MULTIPLYING BY AIDP TRANSPOSE.  THIS NORMALLY IS UNITY.
                C
ISN 0129              CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0130              RX(JJ) = AIDP(1,1)*T1 + AIDP(2,1)*T2 + AIDP(3,1)*T3
ISN 0131              RY(JJ) = AIDP(1,2)*T1 + AIDP(2,2)*T2 + AIDP(3,2)*T3
ISN 0132              RZ(JJ) = AIDP(1,3)*T1 + AIDP(2,3)*T2 + AIDP(3,3)*T3
ISN 0133         3000 CONTINUE
ISN 0134         2051 CONTINUE
ISN 0135              PRINT 2014
ISN 0136         2014 FORMAT(/ 1X,'VEHICLE INERTIAS (IN-LB-SEC**2)')
ISN 0137              XIG = 0
ISN 0138              YIG = 0
ISN 0139              ZIG = 0
ISN 0140              DO 2015 I=1,NM
ISN 0141              IF(IMDRI(I).NE.0) GO TO 2015
ISN 0143              XARM = XDP(I) - XGDP
ISN 0144              YARM = YDP(I) - YGDP
ISN 0145              ZARM = ZDP(I) - ZGDP
ISN 0146              GOODY1 = WGT(I)*(YARM*YARM+ZARM*ZARM)/386.
ISN 0147              GOODY2 = WGT(I)*(XARM*XARM+ZARM*ZARM)/386.
ISN 0148              GOODY3 = WGT(I)*(XARM*XARM+YARM*YARM)/386.
ISN 0149              XIG = XIG+XI(I)+GOODY1
ISN 0150              YIG = YIG+YI(I)+GOODY2
ISN 0151              ZIG = ZIG+ZI(I)+GOODY3
ISN 0152              IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2015
ISN 0154              XIG = XIG+XI(I)+GOODY1
ISN 0155              YIG = YIG+YI(I)+GOODY2
ISN 0156              ZIG = ZIG+ZI(I)+GOODY3
ISN 0157         2015 CONTINUE
ISN 0158              PRINT 2016,XIG,YIG,ZIG
ISN 0159         2016 FORMAT(1X,'I(XX) = ',1PE11.5 / 1X,'I(YY) = ',1PE11.5 / 1X,
                     1'I(ZZ) = ',1PE11.5)
ISN 0160              DO 2022 IJ=1,NB
ISN 0161              I = IG(IJ)
ISN 0162              J = JG(IJ)
ISN 0163              M = MG(IJ)
ISN 0164              N = NG(IJ)
ISN 0165              IF(M.EQ.0) GO TO 5020
ISN 0167              DO 5010 JI=1,NNP
ISN 0168              IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 5020
ISN 0170         5010 CONTINUE
ISN 0171         5020 IF(N.EQ.0) GO TO 5030
ISN 0173              DO 5040 JJ=1,NNP
ISN 0174              IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5030
```

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ISN 0176      5040 CONTINUE
                C
                C     THE FOLLOWING CODE GETS CLTEST(IJ),WHICH IS 1 IF BEAM IJ
                C     LIES ENTIRELY IN THE CENTER PLANE OF THE AIRPLANE.THIS
                C     IS USED IN DERIV FOR A NUMBER OF TESTS.
                C
ISN 0177      5030 CLTEST(IJ) = 0.
ISN 0178           IF(SYMFLG.NE.1.) GO TO 2022
ISN 0180           IF(YDP(I).NE.0.OR.YDP(J).NE.0.) GO TO 2022
                C
                C  BOTH MASSES ON CENTERLINE.
                C
ISN 0182           IF(M.EQ.0.AND.N.EQ.0) GO TO 5000
ISN 0184           IF(M.EQ.0) GO TO 5001
ISN 0186           IF(N.EQ.0) GO TO 5002
ISN 0188           IF(YNPDP(JI).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0190           GO TO 2022
ISN 0191      5001 IF(YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0193           GO TO 2022
ISN 0194      5002 IF(YNPDP(JI).EQ.0.) GO TO 5000
ISN 0196           GO TO 2022
ISN 0197      5000 CLTEST(IJ) = 1.
ISN 0198      2022 CONTINUE
ISN 0199           IF (NIC.LE. 0)  RETURN
                C
                C     COMPUTE PREL. UNCOUPLED LOADS AND DEFLECTIONS
                C
ISN 0201           PRINT 5011
ISN 0202      5011 FORMAT(// 1X,'BEAM LOADS')
ISN 0203           PRINT 5012
ISN 0204      5012 FORMAT(// 6X,'BEAM',19X,'AXIAL LOAD',19X,'SHEAR FORCE',22X,
                  *        'MOMENT',20X,'BEAM' / 2X,'IJ  I  J  M  N',3X,'BUCKLING',
                  *        4X,'TENSION   COMPRESSION  LATERAL(Y) VERTICAL(Z)',3X,
                  *        'ROLL(X)',5X,'PITCH(Y)',5X,'YAW(Z)',3X,'IJ  I  J  M  N' / )
ISN 0205           DO 2400 IJ=1,NB
ISN 0206           IF(YY(IJ) .LE. ZZ(IJ)) GO TO 5013
ISN 0208           YZMIN(IJ)=ZZ(IJ)
ISN 0209           GO TO 5014
                C     YZMIN = MIN.CROSS SECTION AREA INERTIA
ISN 0210      5013 YZMIN(IJ)=YY(IJ)
                C     CALC.FORCES AND MOMENTS
                C     AXIAL FORCES
ISN 0211      5014 PCRFFY=4.*PI*PI*E(IJ)*YY(IJ)/(XLB(IJ)**2)
ISN 0212           PCRFFZ=4.*PI*PI*E(IJ)*ZZ(IJ)/(XLB(IJ)**2)
ISN 0213           PTENS=STENS(MC(IJ))*AA(IJ)
ISN 0214           PCOMP=SCOMP(MC(IJ))*AA(IJ)
                C     SHEAR FORCES
ISN 0215           FY=.67*SHEAR(MC(IJ))*AA(IJ)
ISN 0216           FZ=FY
                C     MOMENTS
ISN 0217           IF(XIQ(IJ).NE.0.) GO TO 400
ISN 0219           THOMX = 0.
ISN 0220           GO TO 410
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ISN 0221      400 TMOMX=SHEAR(MC(IJ))/XIQ(IJ)
ISN 0222      410 SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))
ISN 0223          IF(Z1(IJ).NE.0.) GO TO 420
ISN 0225          BENDMY = 0.
ISN 0226          GO TO 430
ISN 0227      420 BENDMY=SYIELD*YY(IJ)/Z1(IJ)
ISN 0228      430 IF(Z2(IJ).NE.0.) GO TO 440
ISN 0230          BENDMZ = 0.
ISN 0231          GO TO 450
ISN 0232      440 BENDMZ=SYIELD*ZZ(IJ)/Z2(IJ)
              C
              C   CHECK BEAM END CONDITIONS.
              C
ISN 0233      450 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 100
ISN 0235          IF(PY(IJ).EQ.0.OR.PYJ(IJ).EQ.0) GO TO 110
              C  PINNED-PINNED.
ISN 0237          PCRY = PCRFFY/4.
ISN 0238          BENDMY = 0.
ISN 0239          FZ = 0.
ISN 0240          GO TO 120
              C  FIXED-PINNED.
ISN 0241      110 PCRY = PCRFFY/2.
ISN 0242          GO TO 120
              C  FIXED-FIXED
ISN 0243      100 PCRY = PCRFFY
ISN 0244      120 IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 200
ISN 0246          IF(PZ(IJ).EQ.0.OR.PZJ(IJ).EQ.0) GO TO 210
              C  PINNED-PINNED.
ISN 0248          PCRZ = PCRFFZ/4.
ISN 0249          BENDMZ = 0.
ISN 0250          FY = 0.
ISN 0251          GO TO 220
              C  FIXED-PINNED.
ISN 0252      210 PCRZ = PCRFFZ/2.
ISN 0253          GO TO 220
              C  FIXED-FIXED
ISN 0254      200 PCRZ = PCRFFZ
ISN 0255      220 PCR(IJ) = PCRZ
ISN 0256          IF(PCRY.LT.PCRZ) PCR(IJ)=PCRY
ISN 0258     5018 PRINT 5015,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),PCR(IJ),PTENS,
                 1 PCOMP,FY,FZ,TMOMX,BENDMY,BENDMZ,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ))
ISN 0259     5015 FORMAT(1X,5I3,1P8E12.4,5I3)
ISN 0260     2400 CONTINUE
ISN 0261          PRINT 5050
ISN 0262     5050 FORMAT(// 1X,'BEAM DEFLECTIONS')
ISN 0263          PRINT 5051
ISN 0264     5051 FORMAT(// 6X,'BEAM',17X,'DEFLECTION',25X,'TRANSLATION DUE TO',23X,
                *       'ROTATION ABOUT' / 2X,'IJ  I  J  M  N',2X,'BUCKLING',4X,
                *       'TENSION  COMPRESSION   F(Y)',7X,'F(Z)',7X,'BM(Z)',6X,
                *       'BM(Y)',5X,'X-AXIS      Y-AXIS      Z-AXIS' / )
              C
              C   CALC.DEFLECTIONS
              C
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              C     AXIAL DEFLECTIONS                                              00003060
              C                                                                    00003070
ISN 0265            DO 2500 IJ=1,NB                                                00003080
ISN 0266            SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))                    00003090
ISN 0267            IF(XK3(1,1,IJ) .EQ. 0.0) GO TO 5330                            00003100
ISN 0269            XDEFB=PCR(IJ)/XK3(1,1,IJ)                                      00003110
ISN 0270            XDEFT=STENS(MC(IJ))*AA(IJ)/XK3(1,1,IJ)                         00003120
ISN 0271            XDEFC=SCOMP(MC(IJ))*AA(IJ)/XK3(1,1,IJ)                         00003130
ISN 0272            GO TO 5340                                                     00003140
ISN 0273       5330 XDEFB = 0.0                                                    00003150
ISN 0274            XDEFT = 0.0                                                    00003160
ISN 0275            XDEFC = 0.0                                                    00003170
ISN 0276       5340 CONTINUE                                                       00003180
              C     DUE TO SHEAR FORCES                                            00003190
ISN 0277            IF(XK3(2,2,IJ) .EQ. 0.0) GO TO 5350                            00003200
ISN 0279            YDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(2,2,IJ)                      00003210
ISN 0280            GO TO 5360                                                     00003220
ISN 0281       5350 YDSF = 0.0                                                     00003230
ISN 0282       5360 IF(XK3(3,3,IJ) .EQ. 0.0) GO TO 5370                            00003240
ISN 0284            ZDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(3,3,IJ)                      00003250
ISN 0285            GO TO 5380                                                     00003260
ISN 0286       5370 ZDSF = 0.0                                                     00003270
ISN 0287       5380 CONTINUE                                                       00003280
              C     DEFL. DUE TO BEND.FORCE      ((K55/DEL)*FORCE)                 00003290
ISN 0288            IF(XK3(2,2,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5390                00003300
ISN 0290            YMOMZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XLB(IJ)*XK3(2,2,IJ))            00003310
ISN 0291            GO TO 5400                                                     00003320
ISN 0292       5390 YMOMZ = 0.0                                                    00003330
ISN 0293       5400 IF(XK3(3,3,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5410                00003340
ISN 0295            ZMOMY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XLB(IJ)*XK3(3,3,IJ))            00003350
ISN 0296            GO TO 5420                                                     00003360
ISN 0297       5410 ZMOMY = 0.0                                                    00003370
ISN 0298       5420 CONTINUE                                                       00003380
              C     TORSIONAL ROTATION                                             00003390
ISN 0299            IF(XK3(4,4,IJ).NE.0.AND.XIQ(IJ).NE.0.) GO TO 5317              00003400
ISN 0301            ROTX=0.0                                                       00003410
ISN 0302            GO TO 5318                                                     00003420
ISN 0303       5317 ROTX=SHEAR(MC(IJ))/XIQ(IJ)/XK3(4,4,IJ)                         00003430
              C     BEND. ROTATION    ((K33/DEL)*MOM.)                             00003440
ISN 0304       5318 IF(XK3(5,5,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5430                00003450
ISN 0306            ROTY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XK3(5,5,IJ))                     00003460
ISN 0307            GO TO 5440                                                     00003470
ISN 0308       5430 ROTY = 0.0                                                     00003480
ISN 0309       5440 IF(XK3(6,6,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5450                00003490
ISN 0311            ROTZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XK3(6,6,IJ))                     00003500
ISN 0312            GO TO 5460                                                     00003510
ISN 0313       5450 ROTZ = 0.0                                                     00003520
ISN 0314       5460 CONTINUE                                                       00003530
ISN 0315       5316 PRINT 5319, (IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),XDEFB,XDEFT,XDEFC, 00003540
                  1 YDSF,ZDSF,YMOMZ,ZMOMY,ROTX,ROTY,ROTZ)                          00003550
ISN 0316       5319 FORMAT(1X,5I3,1P10E11.3)                                       00003560
ISN 0317       2500 CONTINUE                                                       00003570
ISN 0318            RETURN                                                         00003580
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ISN 0319 END 00003590

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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334RSIN  AT LEVEL 006 AS OF 06/25/79
              C          DATA SET D2332VRI   AT LEVEL 005 AS OF 01/27/78            00000010
  ISN 0002          SUBROUTINE RSIN(IMODEL,ICASE,IMSEC)                             00000020
              C                                                                     00000030
              C                                                                     00000040
              C                                                                     00000050
  ISN 0003          IMPLICIT REAL*8(A-H,O-Z)                                        00000060
  ISN 0004          REAL*8 KUN, MODEL, IMODEL, KEI, KETOTL                          00000070
  ISN 0005          REAL*4 XKS, XKI, XKR, ENGSMY                                    00000080
  ISN 0006          INTEGER*4 TITLE(40),UNIT,CASE,HEADER(24),BPL(100,3)             00000090
  ISN 0007          INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)           00000100
  ISN 0008          INTEGER*2 NLSFLG,CHUG,N1,IJPR,NN,INBUFF,IG,JG,IBS,JBS           00000110
  ISN 0009          COMMON/DEIN/ XMBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),   00000120
                   1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000130
                   2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180), 00000140
                   3              MVP                                               00000150
  ISN 0010          COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),        00000160
                   1              FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150) 00000170
  ISN 0011          COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),   00000180
                   1                XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,  00000190
                   2                PETOTL,SETOTL,DETOTL,CETOTL,FETOTL              00000200
  ISN 0012          COMMON/MADE/ KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,     00000210
                   1 TPL(100),BPL,KPL                                               00000220
  ISN 0013          COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),     00000230
                   1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)        00000240
  ISN 0014          COMMON/INPR/ NDRI,NSP                                           00000250
  ISN 0015          COMMON                      XX(80),XY(80),XZ(80),XL(80),XM(80), 00000260
                   1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),  00000270
                   2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80), 00000280
                   5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),         00000290
                   6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),  00000300
                   7 PHIOLD(80),THEOLD(80),PSIOLD(80),                              00000310
                   8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),  00000320
                   9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),  00000330
                   A TKR(200),TPEN(80),DTHALF,                                      00000340
                   B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT                 00000350
  ISN 0016          COMMON/NP00I4/ NNP                                              00000360
  ISN 0017          COMMON/NP01R8/ XNP(50),YNP(50),ZNP(50),UNP(50),VNP(50),WNP(50),  00000370
                   1 XDNP(50),YDNP(50),ZDNP(50),XACCNP(50),YACCNP(50),ZACCNP(50),   00000380
                   2 SBUCKR(150),PCR(150)                                           00000390
  ISN 0018          COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),  00000400
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                 1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                 2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                 3 YIMNPL(50),ZIMNPL(50)
ISN 0019           COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),
                 1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),
                 2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO
ISN 0020           COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                 A CEIKF(40),
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                 C NM,NB,I,J,IG(150),JG(150),
                 D N1(900),NN(40),IJPR(150)
ISN 0021           COMMON/CFPR/FSPRNG(40,8),DELG(40)
ISN 0022           COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),
                 1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                 2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0023           COMMON/MAPR/ ETOTTO, ENGSMY(6,200), INGSCT
ISN 0024           COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,NPH,NMTL,NPTS(50),
                 1 NVBM,IJPRT(14),IPHDP(80),NFBM
ISN 0025           COMMON /MAX/ IRUPSW(150), IPENSW(80), VEEBAR(900), ZINIT(80),
                 1             DPHIIJ(150), FUB(150)
ISN 0026           DATA UNIT/21/
             C  ...FIND DESIRED CASE...
             C
ISN 0027        10 CALL OPNIN(HEADER,24,UNIT,IER)
ISN 0028           IF (IER .NE. 0) STOP
ISN 0030           CALL DATIN(MODEL ,8HMODEL   ,2,UNIT,IER)
ISN 0031           CALL DATIN(CASE  ,8HCASE    ,1,UNIT,IER)
ISN 0032           CALL DATIN(MSEC  ,8HMSEC    ,1,UNIT,IER)
ISN 0033           IF ( (MODEL.EQ.IMODEL) .AND. (CASE.EQ.ICASE)
                 1                        .AND. (MSEC.EQ.IMSEC) )   GO TO 20
ISN 0035           CALL CLSIN(UNIT,IER)
ISN 0036           IF (IER .NE. 0) STOP
ISN 0038           GO TO 10
             C
             C  ...RETRIEVE VARIABLES...
             C
ISN 0039        20 CALL DATIN(TIME  ,8HTIME    ,2,UNIT,IER)
             C
             C     ...INDICES...
             C
ISN 0040           CALL DATIN(KRCONT,8HKRCONT  ,1,UNIT,IER)
ISN 0041           CALL DATIN(KPEN  ,8HKPEN    ,1,UNIT,IER)
ISN 0042           CALL DATIN(KKONT ,8HKKONT   ,1,UNIT,IER)
ISN 0043           CALL DATIN(KPL   ,8HKPL     ,1,UNIT,IER)
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              C                                                              00000940
              C     ...ARRAYS...                                             00000950
              C                                                              00000960
ISN 0044            NM2 = 2*NM                                               00000970
ISN 0045            CALL DATIN(P     ,8HP       ,NM2,UNIT,IER)               00000980
ISN 0046            CALL DATIN(Q     ,8HQ       ,NM2,UNIT,IER)               00000990
ISN 0047            CALL DATIN(R     ,8HR       ,NM2,UNIT,IER)               00001000
ISN 0048            CALL DATIN(U     ,8HU       ,NM2,UNIT,IER)               00001010
ISN 0049            CALL DATIN(V     ,8HV       ,NM2,UNIT,IER)               00001020
ISN 0050            CALL DATIN(W     ,8HW       ,NM2,UNIT,IER)               00001030
ISN 0051            CALL DATIN(X     ,8HX       ,NM2,UNIT,IER)               00001040
ISN 0052            CALL DATIN(Y     ,8HY       ,NM2,UNIT,IER)               00001050
ISN 0053            CALL DATIN(Z     ,8HZ       ,NM2,UNIT,IER)               00001060
ISN 0054            CALL DATIN(PHI   ,8HPHI     ,NM2,UNIT,IER)               00001070
ISN 0055            CALL DATIN(THETA ,8HTHETA   ,NM2,UNIT,IER)               00001080
ISN 0056            CALL DATIN(PSI   ,8HPSI     ,NM2,UNIT,IER)               00001090
ISN 0057            CALL DATIN(PDOT  ,8HPDOT    ,NM2,UNIT,IER)               00001100
ISN 0058            CALL DATIN(QDOT  ,8HQDOT    ,NM2,UNIT,IER)               00001110
ISN 0059            CALL DATIN(RDOT  ,8HRDOT    ,NM2,UNIT,IER)               00001120
ISN 0060            CALL DATIN(UDOT  ,8HUDOT    ,NM2,UNIT,IER)               00001130
ISN 0061            CALL DATIN(VDOT  ,8HVDOT    ,NM2,UNIT,IER)               00001140
ISN 0062            CALL DATIN(WDOT  ,8HWDOT    ,NM2,UNIT,IER)               00001150
ISN 0063            CALL DATIN(XDOT  ,8HXDOT    ,NM2,UNIT,IER)               00001160
ISN 0064            CALL DATIN(YDOT  ,8HYDOT    ,NM2,UNIT,IER)               00001170
ISN 0065            CALL DATIN(ZDOT  ,8HZDOT    ,NM2,UNIT,IER)               00001180
ISN 0066            CALL DATIN(PHIDOT,8HPHIDOT  ,NM2,UNIT,IER)               00001190
ISN 0067            CALL DATIN(THEDOT,8HTHEDOT  ,NM2,UNIT,IER)               00001200
ISN 0068            CALL DATIN(PSIDOT,8HPSIDOT  ,NM2,UNIT,IER)               00001210
ISN 0069            CALL DATIN(POLD  ,8HPOLD    ,NM2,UNIT,IER)               00001220
ISN 0070            CALL DATIN(QOLD  ,8HQOLD    ,NM2,UNIT,IER)               00001230
ISN 0071            CALL DATIN(ROLD  ,8HROLD    ,NM2,UNIT,IER)               00001240
ISN 0072            CALL DATIN(UOLD  ,8HUOLD    ,NM2,UNIT,IER)               00001250
ISN 0073            CALL DATIN(VOLD  ,8HVOLD    ,NM2,UNIT,IER)               00001260
ISN 0074            CALL DATIN(WOLD  ,8HWOLD    ,NM2,UNIT,IER)               00001270
ISN 0075            CALL DATIN(XOLD  ,8HXOLD    ,NM2,UNIT,IER)               00001280
ISN 0076            CALL DATIN(YOLD  ,8HYOLD    ,NM2,UNIT,IER)               00001290
ISN 0077            CALL DATIN(ZOLD  ,8HZOLD    ,NM2,UNIT,IER)               00001300
ISN 0078            CALL DATIN(PHIOLD,8HPHIOLD  ,NM2,UNIT,IER)               00001310
ISN 0079            CALL DATIN(THEOLD,8HTHEOLD  ,NM2,UNIT,IER)               00001320
ISN 0080            CALL DATIN(PSIOLD,8HPSIOLD  ,NM2,UNIT,IER)               00001330
ISN 0081            CALL DATIN(DX    ,8HDX      ,NM2,UNIT,IER)               00001340
ISN 0082            CALL DATIN(DY    ,8HDY      ,NM2,UNIT,IER)               00001350
ISN 0083            CALL DATIN(DZ    ,8HDZ      ,NM2,UNIT,IER)               00001360
ISN 0084            CALL DATIN(XACC  ,8HXACC    ,NM2,UNIT,IER)               00001370
ISN 0085            CALL DATIN(YACC  ,8HYACC    ,NM2,UNIT,IER)               00001380
ISN 0086            CALL DATIN(ZACC  ,8HZACC    ,NM2,UNIT,IER)               00001390
ISN 0087            CALL DATIN(XACF  ,8HXACF    ,NM2,UNIT,IER)               00001400
ISN 0088            CALL DATIN(YACF  ,8HYACF    ,NM2,UNIT,IER)               00001410
ISN 0089            CALL DATIN(ZACF  ,8HZACF    ,NM2,UNIT,IER)               00001420
ISN 0090            CALL DATIN(XACFD ,8HXACFD   ,NM2,UNIT,IER)               00001430
ISN 0091            CALL DATIN(YACFD ,8HYACFD   ,NM2,UNIT,IER)               00001440
ISN 0092            CALL DATIN(ZACFD ,8HZACFD   ,NM2,UNIT,IER)               00001450
ISN 0093            CALL DATIN(XAFOLD,8HXAFOLD  ,NM2,UNIT,IER)               00001460
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ISN 0094          CALL DATIN(YAFOLD,8HYAFOLD  ,NM2,UNIT,IER)                  00001470
ISN 0095          CALL DATIN(ZAFOLD,8HZAFOLD  ,NM2,UNIT,IER)                  00001480
ISN 0096          CALL DATIN(XIMP   ,8HXIMP    ,NM2,UNIT,IER)                  00001490
ISN 0097          CALL DATIN(YIMP   ,8HYIMP    ,NM2,UNIT,IER)                  00001500
ISN 0098          CALL DATIN(ZIMP   ,8HZIMP    ,NM2,UNIT,IER)                  00001510
ISN 0099          CALL DATIN(XIMPOL,8HXIMPOL  ,NM2,UNIT,IER)                  00001520
ISN 0100          CALL DATIN(YIMPOL,8HYIMPOL  ,NM2,UNIT,IER)                  00001530
ISN 0101          CALL DATIN(ZIMPOL,8HZIMPOL  ,NM2,UNIT,IER)                  00001540
ISN 0102          CALL DATIN(ZINIT ,8HZINIT   ,NM2,UNIT,IER)                  00001550
ISN 0103          CALL DATIN(PINO  ,8HPINO    ,NM2,UNIT,IER)                  00001560
ISN 0104          CALL DATIN(QINO  ,8HQINO    ,NM2,UNIT,IER)                  00001570
ISN 0105          CALL DATIN(RINO  ,8HRINO    ,NM2,UNIT,IER)                  00001580
ISN 0106          CALL DATIN(DPIN  ,8HDPIN    ,NM2,UNIT,IER)                  00001590
ISN 0107          CALL DATIN(DQIN  ,8HDQIN    ,NM2,UNIT,IER)                  00001600
ISN 0108          CALL DATIN(DRIN  ,8HDRIN    ,NM2,UNIT,IER)                  00001610
ISN 0109          CALL DATIN(PIN   ,8HPIN     ,NM2,UNIT,IER)                  00001620
ISN 0110          CALL DATIN(QIN   ,8HQIN     ,NM2,UNIT,IER)                  00001630
ISN 0111          CALL DATIN(RIN   ,8HRIN     ,NM2,UNIT,IER)                  00001640
ISN 0112          CALL DATIN(KEI   ,8HKEI     ,NM2,UNIT,IER)                  00001650
ISN 0113          CALL DATIN(PEI   ,8HPEI     ,NM2,UNIT,IER)                  00001660
ISN 0114          CALL DATIN(XSE   ,8HXSE     ,NM2,UNIT,IER)                  00001670
ISN 0115          CALL DATIN(XDE   ,8HXDE     ,NM2,UNIT,IER)                  00001680
ISN 0116          CALL DATIN(XCE   ,8HXCE     ,NM2,UNIT,IER)                  00001690
ISN 0117          CALL DATIN(XFE   ,8HXFE     ,NM2,UNIT,IER)                  00001700
ISN 0118          CALL DATIN(XETOT ,8HXETOT   ,NM2,UNIT,IER)                  00001710
ISN 0119          CALL DATIN(XPCT  ,8HXPCT    ,NM2,UNIT,IER)                  00001720
ISN 0120          CALL DATIN(XETOTO,8HXETOTO  ,NM2,UNIT,IER)                  00001730
ISN 0121          NM9 = 9*2*NM                                                 00001740
ISN 0122          CALL DATIN(BIJ   ,8HBIJ     ,NM9,UNIT,IER)                  00001750
ISN 0123          CALL DATIN(IPENSW,8HIPENSW  ,NM ,UNIT,IER)                  00001760
            C                                                                  00001770
            C                                                                  00001780
            C                                                                  00001790
ISN 0124          NNP2 = 2*NNP                                                 00001800
ISN 0125          CALL DATIN(XNP    ,8HXNP     ,NNP2,UNIT,IER)                 00001810
ISN 0126          CALL DATIN(YNP    ,8HYNP     ,NNP2,UNIT,IER)                 00001820
ISN 0127          CALL DATIN(ZNP    ,8HZNP     ,NNP2,UNIT,IER)                 00001830
ISN 0128          CALL DATIN(XDNP   ,8HXDNP    ,NNP2,UNIT,IER)                 00001840
ISN 0129          CALL DATIN(YDNP   ,8HYDNP    ,NNP2,UNIT,IER)                 00001850
ISN 0130          CALL DATIN(ZDNP   ,8HZDNP    ,NNP2,UNIT,IER)                 00001860
ISN 0131          CALL DATIN(UNP    ,8HUNP     ,NNP2,UNIT,IER)                 00001870
ISN 0132          CALL DATIN(VNP    ,8HVNP     ,NNP2,UNIT,IER)                 00001880
ISN 0133          CALL DATIN(WNP    ,8HWNP     ,NNP2,UNIT,IER)                 00001890
ISN 0134          CALL DATIN(XACCNP,8HXACCNP  ,NNP2,UNIT,IER)                 00001900
ISN 0135          CALL DATIN(YACCNP,8HYACCNP  ,NNP2,UNIT,IER)                 00001910
ISN 0136          CALL DATIN(ZACCNP,8HZACCNP  ,NNP2,UNIT,IER)                 00001920
ISN 0137          CALL DATIN(XACNPF,8HXACNPF  ,NNP2,UNIT,IER)                 00001930
ISN 0138          CALL DATIN(YACNPF,8HYACNPF  ,NNP2,UNIT,IER)                 00001940
ISN 0139          CALL DATIN(ZACNPF,8HZACNPF  ,NNP2,UNIT,IER)                 00001950
ISN 0140          CALL DATIN(XNPFD ,8HXNPFD   ,NNP2,UNIT,IER)                 00001960
ISN 0141          CALL DATIN(YNPFD ,8HYNPFD   ,NNP2,UNIT,IER)                 00001970
ISN 0142          CALL DATIN(ZNPFD ,8HZNPFD   ,NNP2,UNIT,IER)                 00001980
ISN 0143          CALL DATIN(XANPFO,8HXANPFO  ,NNP2,UNIT,IER)                 00001990
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ISN 0144          CALL DATIN(YANPFO,8HYANPFO  ,NNP2,UNIT,IER)
ISN 0145          CALL DATIN(ZANPFO,8HZANPFO  ,NNP2,UNIT,IER)
ISN 0146          CALL DATIN(XIMPNP,8HXIMPNP  ,NNP2,UNIT,IER)
ISN 0147          CALL DATIN(YIMPNP,8HYIMPNP  ,NNP2,UNIT,IER)
ISN 0148          CALL DATIN(ZIMPNP,8HZIMPNP  ,NNP2,UNIT,IER)
ISN 0149          CALL DATIN(XIMNPL,8HXIMNPL  ,NNP2,UNIT,IER)
ISN 0150          CALL DATIN(YIMNPL,8HYIMNPL  ,NNP2,UNIT,IER)
ISN 0151          CALL DATIN(ZIMNPL,8HZIMNPL  ,NNP2,UNIT,IER)
            C
            C
            C
ISN 0152          NB2 = 2*NB
ISN 0153          CALL DATIN(KFL35 ,8HKFL35   ,NB,UNIT,IER)
ISN 0154          CALL DATIN(KFL26 ,8HKFL26   ,NB,UNIT,IER)
ISN 0155          CALL DATIN(FL26I ,8HFL26I   ,NB,UNIT,IER)
ISN 0156          CALL DATIN(FL26J ,8HFL26J   ,NB,UNIT,IER)
ISN 0157          CALL DATIN(FL35I ,8HFL35I   ,NB,UNIT,IER)
ISN 0158          CALL DATIN(FL35J ,8HFL35J   ,NB,UNIT,IER)
ISN 0159          CALL DATIN(SEIJ  ,8HSEIJ    ,NB2,UNIT,IER)
ISN 0160          CALL DATIN(DEIJ  ,8HDEIJ    ,NB2,UNIT,IER)
ISN 0161          CALL DATIN(IRUPSW,8HIRUPSW  ,NB,UNIT,IER)
ISN 0162          CALL DATIN(DPHIIJ,8HDPHIIJ  ,NB2,UNIT,IER)
ISN 0163          CALL DATIN(PHIIJ ,8HPHIIJ   ,NB2,UNIT,IER)
ISN 0164          CALL DATIN(THEIJ ,8HTHEIJ   ,NB2,UNIT,IER)
ISN 0165          CALL DATIN(PSIIJ ,8HPSIIJ   ,NB2,UNIT,IER)
ISN 0166          CALL DATIN(SBUCKR,8HSBUCKR  ,NB2,UNIT,IER)
ISN 0167          CALL DATIN(DRI   ,8HDRI     ,NB2,UNIT,IER)
ISN 0168          CALL DATIN(FUB   ,8HFUB     ,NB2,UNIT,IER)
ISN 0169          NB4 = 2*2*NB
ISN 0170          CALL DATIN(VEEN  (1,1),8HVEEN    ,NB4,UNIT,IER)
ISN 0171          NB12 = 2*6*NB
ISN 0172          CALL DATIN(SUMDF (1,1),8HSUMDF   ,NB12,UNIT,IER)
ISN 0173          CALL DATIN(FINT  (1,1),8HFINT    ,NB12,UNIT,IER)
ISN 0174          CALL DATIN(SUMDFI(1,1),8HSUMDFI  ,NB12,UNIT,IER)
ISN 0175          CALL DATIN(FINTI (1,1),8HFINTI   ,NB12,UNIT,IER)
ISN 0176          NB18 = 2*9*NB
ISN 0177          CALL DATIN(VEEBAR,8HVEEBAR  ,NB18,UNIT,IER)
ISN 0178          NB6 = 6*NB
ISN 0179          NB3 = 3*NB
ISN 0180          NB12 = 6*2*NB
ISN 0181          CALL DATIN(N1    ,8HN1      ,NB3,UNIT,IER)
ISN 0182          CALL DATIN(VEE   ,8HVEE     ,NB12,UNIT,IER)
ISN 0183          CALL DATIN(KRFLAG,8HKRFLAG  ,NB6,UNIT,IER)
ISN 0184          NOL2=2*NOLEO
ISN 0185          CALL DATIN(YOLEO   ,8HYOLEO   ,NOL2,UNIT,IER)
ISN 0186          DO 100  K = 1,4
ISN 0187            CALL DATIN(FRD   (1,K),8HFRD     ,NB2,UNIT,IER)
ISN 0188            CALL DATIN(FRS   (1,K),8HFRS     ,NB2,UNIT,IER)
ISN 0189      100 CONTINUE
ISN 0190          NLI = NLB/2 + MOD(NLB,2)
ISN 0191          CALL DATIN(CHUG  ,8HCHUG    ,NLI,UNIT,IER)
            C
            C
```

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              C
ISN 0192            KR2 = 2*KRCONT
ISN 0193            CALL DATIN(TKR   ,8HTKR     ,KR2,UNIT,IER)
ISN 0194            KR4 = 4*KRCONT
ISN 0195            CALL DATIN(KRBEAM(1,1),8HKRBEAM  ,KR4,UNIT,IER)
ISN 0196            CALL DATIN(IPEN  ,8HIPEN    ,KPEN,UNIT,IER)
ISN 0197            KPEN2 = 2*KPEN
ISN 0198            CALL DATIN(TPEN  ,8HTPEN    ,KPEN2,UNIT,IER)
ISN 0199            KPL2=2*KPL
ISN 0200            CALL DATIN(TPL   ,8HTPL     ,KPL2,UNIT,IER)
ISN 0201            DO 120 K=1,3
ISN 0202            CALL DATIN(BPL(1,K),8HBPL      ,KPL,UNIT,IER)
ISN 0203        120 CONTINUE
              C
              C
              C
ISN 0204            KK2=2*KKONT
ISN 0205            CALL DATIN(TSP   ,8HTSP     ,KK2,UNIT,IER)
ISN 0206            KK5=5*KKONT
ISN 0207            CALL DATIN(KKSP(1,1),8HKKSP    ,KK5,UNIT,IER)
ISN 0208            KK52=5*2*KKONT
ISN 0209            CALL DATIN(EXSP(1,1),8HEXSP    ,KK52,UNIT,IER)
ISN 0210            NSP2 = 2*NSP
ISN 0211            NS2 = NSP/2 + MOD(NSP,2)
ISN 0212            CALL DATIN(DELG  ,8HDELG    ,NSP2,UNIT,IER)
ISN 0213            CALL DATIN(IBS   ,8HIBS     ,NS2,UNIT,IER)
ISN 0214            CALL DATIN(JBS   ,8HJBS     ,NS2,UNIT,IER)
ISN 0215            CALL DATIN(SBAR  ,8HSBAR    ,NSP2,UNIT,IER)
ISN 0216            CALL DATIN(FSPBAR,8HFSPBAR  ,NSP2,UNIT,IER)
ISN 0217            CALL DATIN(FSPOP ,8HFSPOP   ,NSP2,UNIT,IER)
ISN 0218            CALL DATIN(SCP   ,8HSCP     ,NSP2,UNIT,IER)
ISN 0219            CALL DATIN(STEMP1,8HSTEMP1  ,NSP2,UNIT,IER)
ISN 0220            CALL DATIN(STEMP2,8HSTEMP2  ,NSP2,UNIT,IER)
ISN 0221            CALL DATIN(STEMP3,8HSTEMP3  ,NSP2,UNIT,IER)
ISN 0222            CALL DATIN(STEMP4,8HSTEMP4  ,NSP2,UNIT,IER)
ISN 0223            CALL DATIN(STEMP5,8HSTEMP5  ,NSP2,UNIT,IER)
ISN 0224            CALL DATIN(NN    ,8HNN      ,NS2,UNIT,IER)
ISN 0225            CALL DATIN(CEIK  ,8HCEIK    ,NSP2,UNIT,IER)
ISN 0226            CALL DATIN(CEIKF ,8HCEIKF   ,NSP2,UNIT,IER)
ISN 0227            CALL DATIN(SC    ,8HSC      ,NSP2,UNIT,IER)
ISN 0228            CALL DATIN(KUN   ,8HKUN     ,NSP2,UNIT,IER)
ISN 0229            DO 200 K=1,8
ISN 0230              CALL DATIN(FSPRNG(1,K),8HFSPRNG  ,NSP2,UNIT,IER)
ISN 0231        200 CONTINUE
ISN 0232            NVCH2 = 2*NVCH
ISN 0233            CALL DATIN(VOL   ,8HVOL     ,NVCH2,UNIT,IER)
ISN 0234            DO 300  K = 1,3
ISN 0235              CALL DATIN(DLVOL (1,K),8HDLVOL   ,NVCH2,UNIT,IER)
ISN 0236        300 CONTINUE
              C
              C
              C
ISN 0237            CALL DATIN(XDOTAP,8HXDOTAP  ,2,UNIT,IER)
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ISN 0238      CALL DATIN(YDOTAP.8HYDOTAP  ,2,UNIT,IER)      00003060
ISN 0239      CALL DATIN(ZDOTAP.8HZDOTAP  ,2,UNIT,IER)      00003070
ISN 0240      CALL DATIN(ETOTTO.8HETOTTO  ,2,UNIT,IER)      00003080
ISN 0241      CALL DATIN(XETOTL,8HXETOTL  ,2,UNIT,IER)      00003090
ISN 0242      CALL DATIN(KETOTL,8HKETOTL  ,2,UNIT,IER)      00003100
ISN 0243      CALL DATIN(PETOTL,8HPETOTL  ,2,UNIT,IER)      00003110
ISN 0244      CALL DATIN(SETOTL,8HSETOTL  ,2,UNIT,IER)      00003120
ISN 0245      CALL DATIN(DETOTL,8HDETOTL  ,2,UNIT,IER)      00003130
ISN 0246      CALL DATIN(CETOTL,8HCETOTL  ,2,UNIT,IER)      00003140
ISN 0247      CALL DATIN(FETOTL,8HFETOTL  ,2,UNIT,IER)      00003150
ISN 0248      CALL DATIN(INGSCT,8HINGSCT  ,1,UNIT,IER)      00003160
ISN 0249      CALL CLSIN(UNIT,IER)                          00003170
ISN 0250      RETURN                                        00003180
ISN 0251      END                                           00003190
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*******************************************************************************************
*                                                                                         *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                  SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
           C           DATA SET D2334RSOUT AT LEVEL 006 AS OF 06/25/79
           C           DATA SET D2332VRO   AT LEVEL 005 AS OF 01/27/78
ISN 0002              SUBROUTINE RSOUT(MODEL,CASE,MSEC)
           C
           C
           C
ISN 0003              IMPLICIT REAL*8(A-H,O-Z)
ISN 0004              REAL*8 KUN, MODEL, KEI, KETOTL
ISN 0005              REAL*4 XKS, XKI, XKR, ENGSMY
ISN 0006              INTEGER*4 TITLE(40),UNIT,CASE,BPL(100,3)
ISN 0007              INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)
ISN 0008              INTEGER*2 NLSFLG,CHUG,N1,IJPR,NN,INBUFF,IG,JG,IBS,JBS
ISN 0009              COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
                     1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
                     2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
                     3              MVP
ISN 0010              COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),
                     1              FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)
ISN 0011              COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),
                     1            XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,
                     2              PETOTL,SETOTL,DETOTL,CETOTL,FETOTL
ISN 0012              COMMON/MADE/ KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,
                     1 TPL(100),BPL,KPL
ISN 0013              COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
                     1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0014              COMMON/INPR/ NDRI,NSP
ISN 0015              COMMON                 XX(80),XY(80),XZ(80),XL(80),XM(80),
                     1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),
                     2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),
                     5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),
                     6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),
                     7 PHIOLD(80),THEOLD(80),PSIOLD(80),
                     8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),
                     9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),
                     A TKR(200),TPEN(80),DTHALF,
                     B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT
ISN 0016              COMMON/NP00I4/ NNP
ISN 0017              COMMON/NP01R8/ XNP(50),YNP(50),ZNP(50),UNP(50),VNP(50),WNP(50),
                     1 XDNP(50),YDNP(50),ZDNP(50),XACCNP(50),YACCNP(50),ZACCNP(50),
                     2 SBUCKR(150),PCR(150)
ISN 0018              COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),
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                1 ZACNPF(50),XIMP(80).YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                3 YIMNPL(50),ZIMNPL(50)
ISN 0019          COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),
                1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),
                2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO
ISN 0020          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                A CEIKF(40),
                B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                C NM,NB,I,J,IG(150),JG(150),
                D N1(900),NN(40),IJPR(150)
ISN 0021          COMMON/CFPR/FSPRNG(40,8),DELG(40)
ISN 0022          COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),
                1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0023          COMMON/MAPR/ ETOTTO, ENGSMY(6,200), INGSCT
ISN 0024          COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,NPH,NMTL,NPTS(50),
                1 NVBM,IJPRT(14),IPHDP(80),NFBM
ISN 0025          COMMON /MAX/ IRUPSW(150), IPENSW(80), VEEBAR(900), ZINIT(80),
                1             DPHIIJ(150), FUB(150)
ISN 0026          DATA UNIT/21/
            C
            C
            C
ISN 0027          CALL OPNOUT(UNIT)
ISN 0028          CALL DATOUT(MODEL ,8HMODEL   ,2,UNIT,IER)
ISN 0029          CALL DATOUT(CASE  ,8HCASE    ,1,UNIT,IER)
ISN 0030          CALL DATOUT(MSEC  ,8HMSEC    ,1,UNIT,IER)
ISN 0031          CALL DATOUT(TIME  ,8HTIME    ,2,UNIT,IER)
            C
            C  ...INDICES...
            C
ISN 0032          CALL DATOUT(KRCONT,8HKRCONT  ,1,UNIT,IER)
ISN 0033          CALL DATOUT(KPEN  ,8HKPEN    ,1,UNIT,IER)
ISN 0034          CALL DATOUT(KKONT ,8HKKONT   ,1,UNIT,IER)
ISN 0035          CALL DATOUT(KPL   ,8HKPL     ,1,UNIT,IER)
            C
            C  ...ARRAYS...
            C
ISN 0036          NM2 = 2*NM
ISN 0037          CALL DATOUT(P     ,8HP       ,NM2,UNIT,IER)
ISN 0038          CALL DATOUT(Q     ,8HQ       ,NM2,UNIT,IER)
ISN 0039          CALL DATOUT(R     ,8HR       ,NM2,UNIT,IER)
ISN 0040          CALL DATOUT(U     ,8HU       ,NM2,UNIT,IER)
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ISN 0041          CALL DATOUT(V     ,8HV       ,NM2,UNIT,IER)                     00000940
ISN 0042          CALL DATOUT(W     ,8HW       ,NM2,UNIT,IER)                     00000950
ISN 0043          CALL DATOUT(X     ,8HX       ,NM2,UNIT,IER)                     00000960
ISN 0044          CALL DATOUT(Y     ,8HY       ,NM2,UNIT,IER)                     00000970
ISN 0045          CALL DATOUT(Z     ,8HZ       ,NM2,UNIT,IER)                     00000980
ISN 0046          CALL DATOUT(PHI   ,8HPHI     ,NM2,UNIT,IER)                     00000990
ISN 0047          CALL DATOUT(THETA ,8HTHETA   ,NM2,UNIT,IER)                     00001000
ISN 0048          CALL DATOUT(PSI   ,8HPSI     ,NM2,UNIT,IER)                     00001010
ISN 0049          CALL DATOUT(PDOT  ,8HPDOT    ,NM2,UNIT,IER)                     00001020
ISN 0050          CALL DATOUT(QDOT  ,8HQDOT    ,NM2,UNIT,IER)                     00001030
ISN 0051          CALL DATOUT(RDOT  ,8HRDOT    ,NM2,UNIT,IER)                     00001040
ISN 0052          CALL DATOUT(UDOT  ,8HUDOT    ,NM2,UNIT,IER)                     00001050
ISN 0053          CALL DATOUT(VDOT  ,8HVDOT    ,NM2,UNIT,IER)                     00001060
ISN 0054          CALL DATOUT(WDOT  ,8HWDOT    ,NM2,UNIT,IER)                     00001070
ISN 0055          CALL DATOUT(XDOT  ,8HXDOT    ,NM2,UNIT,IER)                     00001080
ISN 0056          CALL DATOUT(YDOT  ,8HYDOT    ,NM2,UNIT,IER)                     00001090
ISN 0057          CALL DATOUT(ZDOT  ,8HZDOT    ,NM2,UNIT,IER)                     00001100
ISN 0058          CALL DATOUT(PHIDOT,8HPHIDOT  ,NM2,UNIT,IER)                     00001110
ISN 0059          CALL DATOUT(THEDOT,8HTHEDOT  ,NM2,UNIT,IER)                     00001120
ISN 0060          CALL DATOUT(PSIDOT,8HPSIDOT  ,NM2,UNIT,IER)                     00001130
ISN 0061          CALL DATOUT(POLD  ,8HPOLD    ,NM2,UNIT,IER)                     00001140
ISN 0062          CALL DATOUT(QOLD  ,8HQOLD    ,NM2,UNIT,IER)                     00001150
ISN 0063          CALL DATOUT(ROLD  ,8HROLD    ,NM2,UNIT,IER)                     00001160
ISN 0064          CALL DATOUT(UOLD  ,8HUOLD    ,NM2,UNIT,IER)                     00001170
ISN 0065          CALL DATOUT(VOLD  ,8HVOLD    ,NM2,UNIT,IER)                     00001180
ISN 0066          CALL DATOUT(WOLD  ,8HWOLD    ,NM2,UNIT,IER)                     00001190
ISN 0067          CALL DATOUT(XOLD  ,8HXOLD    ,NM2,UNIT,IER)                     00001200
ISN 0068          CALL DATOUT(YOLD  ,8HYOLD    ,NM2,UNIT,IER)                     00001210
ISN 0069          CALL DATOUT(ZOLD  ,8HZOLD    ,NM2,UNIT,IER)                     00001220
ISN 0070          CALL DATOUT(PHIOLD,8HPHIOLD  ,NM2,UNIT,IER)                     00001230
ISN 0071          CALL DATOUT(THEOLD,8HTHEOLD  ,NM2,UNIT,IER)                     00001240
ISN 0072          CALL DATOUT(PSIOLD,8HPSIOLD  ,NM2,UNIT,IER)                     00001250
ISN 0073          CALL DATOUT(DX    ,8HDX      ,NM2,UNIT,IER)                     00001260
ISN 0074          CALL DATOUT(DY    ,8HDY      ,NM2,UNIT,IER)                     00001270
ISN 0075          CALL DATOUT(DZ    ,8HDZ      ,NM2,UNIT,IER)                     00001280
ISN 0076          CALL DATOUT(XACC  ,8HXACC    ,NM2,UNIT,IER)                     00001290
ISN 0077          CALL DATOUT(YACC  ,8HYACC    ,NM2,UNIT,IER)                     00001300
ISN 0078          CALL DATOUT(ZACC  ,8HZACC    ,NM2,UNIT,IER)                     00001310
ISN 0079          CALL DATOUT(XACF  ,8HXACF    ,NM2,UNIT,IER)                     00001320
ISN 0080          CALL DATOUT(YACF  ,8HYACF    ,NM2,UNIT,IER)                     00001330
ISN 0081          CALL DATOUT(ZACF  ,8HZACF    ,NM2,UNIT,IER)                     00001340
ISN 0082          CALL DATOUT(XACFD ,8HXACFD   ,NM2,UNIT,IER)                     00001350
ISN 0083          CALL DATOUT(YACFD ,8HYACFD   ,NM2,UNIT,IER)                     00001360
ISN 0084          CALL DATOUT(ZACFD ,8HZACFD   ,NM2,UNIT,IER)                     00001370
ISN 0085          CALL DATOUT(XAFOLD,8HXAFOLD  ,NM2,UNIT,IER)                     00001380
ISN 0086          CALL DATOUT(YAFOLD,8HYAFOLD  ,NM2,UNIT,IER)                     00001390
ISN 0087          CALL DATOUT(ZAFOLD,8HZAFOLD  ,NM2,UNIT,IER)                     00001400
ISN 0088          CALL DATOUT(XIMP  ,8HXIMP    ,NM2,UNIT,IER)                     00001410
ISN 0089          CALL DATOUT(YIMP  ,8HYIMP    ,NM2,UNIT,IER)                     00001420
ISN 0090          CALL DATOUT(ZIMP  ,8HZIMP    ,NM2,UNIT,IER)                     00001430
ISN 0091          CALL DATOUT(XIMPOL,8HXIMPOL  ,NM2,UNIT,IER)                     00001440
ISN 0092          CALL DATOUT(YIMPOL,8HYIMPOL  ,NM2,UNIT,IER)                     00001450
ISN 0093          CALL DATOUT(ZIMPOL,8HZIMPOL  ,NM2,UNIT,IER)                     00001460
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ISN 0094      CALL DATOUT(ZINIT ,8HZINIT   ,NM2,UNIT,IER)              00001470
ISN 0095      CALL DATOUT(PINO  ,8HPINO    ,NM2,UNIT,IER)              00001480
ISN 0096      CALL DATOUT(QINO  ,8HQINO    ,NM2,UNIT,IER)              00001490
ISN 0097      CALL DATOUT(RINO  ,8HRINO    ,NM2,UNIT,IER)              00001500
ISN 0098      CALL DATOUT(DPIN  ,8HDPIN    ,NM2,UNIT,IER)              00001510
ISN 0099      CALL DATOUT(DQIN  ,8HDQIN    ,NM2,UNIT,IER)              00001520
ISN 0100      CALL DATOUT(DRIN  ,8HDRIN    ,NM2,UNIT,IER)              00001530
ISN 0101      CALL DATOUT(PIN   ,8HPIN     ,NM2,UNIT,IER)              00001540
ISN 0102      CALL DATOUT(QIN   ,8HQIN     ,NM2,UNIT,IER)              00001550
ISN 0103      CALL DATOUT(RIN   ,8HRIN     ,NM2,UNIT,IER)              00001560
ISN 0104      CALL DATOUT(KEI   ,8HKEI     ,NM2,UNIT,IER)              00001570
ISN 0105      CALL DATOUT(PEI   ,8HPEI     ,NM2,UNIT,IER)              00001580
ISN 0106      CALL DATOUT(XSE   ,8HXSE     ,NM2,UNIT,IER)              00001590
ISN 0107      CALL DATOUT(XDE   ,8HXDE     ,NM2,UNIT,IER)              00001600
ISN 0108      CALL DATOUT(XCE   ,8HXCE     ,NM2,UNIT,IER)              00001610
ISN 0109      CALL DATOUT(XFE   ,8HXFE     ,NM2,UNIT,IER)              00001620
ISN 0110      CALL DATOUT(XETOT ,8HXETOT   ,NM2,UNIT,IER)              00001630
ISN 0111      CALL DATOUT(XPCT  ,8HXPCT    ,NM2,UNIT,IER)              00001640
ISN 0112      CALL DATOUT(XETOTO,8HXETOTO  ,NM2,UNIT,IER)              00001650
ISN 0113      NM9 = 9*2*NM                                             00001660
ISN 0114      CALL DATOUT(BIJ   ,8HBIJ     ,NM9,UNIT,IER)              00001670
ISN 0115      CALL DATOUT(IPENSW,8HIPENSW  ,NM ,UNIT,IER)              00001680
         C                                                             00001690
         C                                                             00001700
         C                                                             00001710
ISN 0116      NNP2 = 2*NNP                                             00001720
ISN 0117      CALL DATOUT(XNP   ,8HXNP     ,NNP2,UNIT,IER)             00001730
ISN 0118      CALL DATOUT(YNP   ,8HYNP     ,NNP2,UNIT,IER)             00001740
ISN 0119      CALL DATOUT(ZNP   ,8HZNP     ,NNP2,UNIT,IER)             00001750
ISN 0120      CALL DATOUT(XDNP  ,8HXDNP    ,NNP2,UNIT,IER)             00001760
ISN 0121      CALL DATOUT(YDNP  ,8HYDNP    ,NNP2,UNIT,IER)             00001770
ISN 0122      CALL DATOUT(ZDNP  ,8HZDNP    ,NNP2,UNIT,IER)             00001780
ISN 0123      CALL DATOUT(UNP   ,8HUNP     ,NNP2,UNIT,IER)             00001790
ISN 0124      CALL DATOUT(VNP   ,8HVNP     ,NNP2,UNIT,IER)             00001800
ISN 0125      CALL DATOUT(WNP   ,8HWNP     ,NNP2,UNIT,IER)             00001810
ISN 0126      CALL DATOUT(XACCNP,8HXACCNP  ,NNP2,UNIT,IER)             00001820
ISN 0127      CALL DATOUT(YACCNP,8HYACCNP  ,NNP2,UNIT,IER)             00001830
ISN 0128      CALL DATOUT(ZACCNP,8HZACCNP  ,NNP2,UNIT,IER)             00001840
ISN 0129      CALL DATOUT(XACNPF,8HXACNPF  ,NNP2,UNIT,IER)             00001850
ISN 0130      CALL DATOUT(YACNPF,8HYACNPF  ,NNP2,UNIT,IER)             00001860
ISN 0131      CALL DATOUT(ZACNPF,8HZACNPF  ,NNP2,UNIT,IER)             00001870
ISN 0132      CALL DATOUT(XNPFD ,8HXNPFD   ,NNP2,UNIT,IER)             00001880
ISN 0133      CALL DATOUT(YNPFD ,8HYNPFD   ,NNP2,UNIT,IER)             00001890
ISN 0134      CALL DATOUT(ZNPFD ,8HZNPFD   ,NNP2,UNIT,IER)             00001900
ISN 0135      CALL DATOUT(XANPFO,8HXANPFO  ,NNP2,UNIT,IER)             00001910
ISN 0136      CALL DATOUT(YANPFO,8HYANPFO  ,NNP2,UNIT,IER)             00001920
ISN 0137      CALL DATOUT(ZANPFO,8HZANPFO  ,NNP2,UNIT,IER)             00001930
ISN 0138      CALL DATOUT(XIMPNP,8HXIMPNP  ,NNP2,UNIT,IER)             00001940
ISN 0139      CALL DATOUT(YIMPNP,8HYIMPNP  ,NNP2,UNIT,IER)             00001950
ISN 0140      CALL DATOUT(ZIMPNP,8HZIMPNP  ,NNP2,UNIT,IER)             00001960
ISN 0141      CALL DATOUT(XIMNPL,8HXIMNPL  ,NNP2,UNIT,IER)             00001970
ISN 0142      CALL DATOUT(YIMNPL,8HYIMNPL  ,NNP2,UNIT,IER)             00001980
ISN 0143      CALL DATOUT(ZIMNPL,8HZIMNPL  ,NNP2,UNIT,IER)             00001990
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                C                                                              00002000
                C                                                              00002010
                C                                                              00002020
ISN 0144              NB2 = 2*NB                                               00002030
ISN 0145              CALL DATOUT(KFL35 ,8HKFL35   ,NB,UNIT,IER)               00002040
ISN 0146              CALL DATOUT(KFL26 ,8HKFL26   ,NB,UNIT,IER)               00002050
ISN 0147              CALL DATOUT(FL26I ,8HFL26I   ,NB,UNIT,IER)               00002060
ISN 0148              CALL DATOUT(FL26J ,8HFL26J   ,NB,UNIT,IER)               00002070
ISN 0149              CALL DATOUT(FL35I ,8HFL35I   ,NB,UNIT,IER)               00002080
ISN 0150              CALL DATOUT(FK35J ,8HFL35J   ,NB,UNIT,IER)               00002090
ISN 0151              CALL DATOUT(SEIJ  ,8HSEIJ    ,NB2,UNIT,IER)              00002100
ISN 0152              CALL DATOUT(DEIJ  ,8HDEIJ    ,NB2,UNIT,IER)              00002110
ISN 0153              CALL DATOUT(IRUPSW,8HIRUPSW  ,NB,UNIT,IER)               00002120
ISN 0154              CALL DATOUT(DPHIIJ,8HDPHIIJ  ,NB2,UNIT,IER)              00002130
ISN 0155              CALL DATOUT(PHIIJ ,8HPHIIJ   ,NB2,UNIT,IER)              00002140
ISN 0156              CALL DATOUT(THEIJ ,8HTHEIJ   ,NB2,UNIT,IER)              00002150
ISN 0157              CALL DATOUT(PSIIJ ,8HPSIIJ   ,NB2,UNIT,IER)              00002160
ISN 0158              CALL DATOUT(SBUCKR,8HSBUCKR  ,NB2,UNIT,IER)              00002170
ISN 0159              CALL DATOUT(DRI   ,8HDRI     ,NB2,UNIT,IER)              00002180
ISN 0160              CALL DATOUT(FUB   ,8HFUB     ,NB2,UNIT,IER)              00002190
ISN 0161              NB4 = 2*2*NB                                             00002200
ISN 0162              CALL DATOUT(VEEN  (1,1),8HVEEN    ,NB4,UNIT,IER)         00002210
ISN 0163              NB12 = 2*6*NB                                            00002220
ISN 0164              CALL DATOUT(SUMDF (1,1),8HSUMDF   ,NB12,UNIT,IER)        00002230
ISN 0165              CALL DATOUT(FINT  (1,1),8HFINT    ,NB12,UNIT,IER)        00002240
ISN 0166              CALL DATOUT(SUMDFI(1,1),8HSUMDFI  ,NB12,UNIT,IER)        00002250
ISN 0167              CALL DATOUT(FINTI (1,1),8HFINTI   ,NB12,UNIT,IER)        00002260
ISN 0168              NB18 = 2*9*NB                                            00002270
ISN 0169              CALL DATOUT(VEEBAR,8HVEEBAR  ,NB18,UNIT,IER)             00002280
ISN 0170              NB3 = 3*NB                                               00002290
ISN 0171              NB6 = 6*NB                                               00002300
ISN 0172              NB12 = 6*2*NB                                            00002310
ISN 0173              CALL DATOUT(NI    ,8HNI      ,NB3,UNIT,IER)              00002320
ISN 0174              CALL DATOUT(VEE   ,8HVEE     ,NB12,UNIT,IER)             00002330
ISN 0175              CALL DATOUT(KRFLAG,8HKRFLAG  ,NB6,UNIT,IER)              00002340
ISN 0176              NOL2=2*NOLEO                                             00002350
ISN 0177              CALL DATOUT(YOLEO  ,8HYOLEO   ,NOL2,UNIT,IER)            00002360
ISN 0178              DO 100  K = 1,4                                          00002370
ISN 0179                CALL DATOUT(FRD   (1,K),8HFRD     ,NB2,UNIT,IER)       00002380
ISN 0180                CALL DATOUT(FRS   (1,K),8HFRS     ,NB2,UNIT,IER)       00002390
ISN 0181          100 CONTINUE                                                 00002400
ISN 0182              NLI = NLB/2 + MOD(NLB,2)                                 00002410
ISN 0183              CALL DATOUT(CHUG  ,8HCHUG    ,NLI,UNIT,IER)              00002420
                C                                                              00002430
                C                                                              00002440
                C                                                              00002450
ISN 0184              KR2 = 2*KRCONT                                           00002460
ISN 0185              CALL DATOUT(TKR   ,8HTKR     ,KR2,UNIT,IER)              00002470
ISN 0186              KR4 = 4*KRCONT                                           00002480
ISN 0187              CALL DATOUT(KRBEAM(1,1),8HKRBEAM  ,KR4,UNIT,IER)         00002490
ISN 0188              CALL DATOUT(IPEN  ,8HIPEN    ,KPEN,UNIT,IER)             00002500
ISN 0189              KPEN2 = 2*KPEN                                           00002510
ISN 0190              CALL DATOUT(TPEN  ,8HTPEN    ,KPEN2,UNIT,IER)            00002520
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ISN 0191          KPL2=2*KPL                                                     00002530
ISN 0192          CALL DATOUT(TPL    ,8HTPL      ,KPL2,UNIT,IER)                 00002540
ISN 0193          DO 120 K=1,3                                                   00002550
ISN 0194          CALL DATOUT(BPL(1,K),8HBPL      ,KPL,UNIT,IER)                 00002560
ISN 0195      120 CONTINUE                                                       00002570
            C                                                                    00002580
            C                                                                    00002590
            C                                                                    00002600
ISN 0196          KK2=2*KKONT                                                    00002610
ISN 0197          CALL DATOUT(TSP    ,8HTSP      ,KK2,UNIT,IER)                  00002620
ISN 0198          KK5=5*KKONT                                                    00002630
ISN 0199          CALL DATOUT(KKSP(1,1),8HKKSP     ,KK5,UNIT,IER)                00002640
ISN 0200          KK52=5*2*KKONT                                                 00002650
ISN 0201          CALL DATOUT(EXSP(1,1),8HEXSP     ,KK52,UNIT,IER)               00002660
ISN 0202          NSP2 = 2*NSP                                                   00002670
ISN 0203          NS2 = NSP/2 + MOD(NSP,2)                                       00002680
ISN 0204          CALL DATOUT(DELG   ,8HDELG     ,NSP2,UNIT,IER)                 00002690
ISN 0205          CALL DATOUT(IBS    ,8HIBS      ,NS2,UNIT,IER)                  00002700
ISN 0206          CALL DATOUT(JBS    ,8HJBS      ,NS2,UNIT,IER)                  00002710
ISN 0207          CALL DATOUT(SBAR   ,8HSBAR     ,NSP2,UNIT,IER)                 00002720
ISN 0208          CALL DATOUT(FSPBAR,8HFSPBAR    ,NSP2,UNIT,IER)                 00002730
ISN 0209          CALL DATOUT(FSPOP  ,8HFSPOP    ,NSP2,UNIT,IER)                 00002740
ISN 0210          CALL DATOUT(SCP    ,8HSCP      ,NSP2,UNIT,IER)                 00002750
ISN 0211          CALL DATOUT(STEMP1,8HSTEMP1    ,NSP2,UNIT,IER)                 00002760
ISN 0212          CALL DATOUT(STEMP2,8HSTEMP2    ,NSP2,UNIT,IER)                 00002770
ISN 0213          CALL DATOUT(STEMP3,8HSTEMP3    ,NSP2,UNIT,IER)                 00002780
ISN 0214          CALL DATOUT(STEMP4,8HSTEMP4    ,NSP2,UNIT,IER)                 00002790
ISN 0215          CALL DATOUT(STEMP5,8HSTEMP5    ,NSP2,UNIT,IER)                 00002800
ISN 0216          CALL DATOUT(NN     ,8HNN       ,NS2,UNIT,IER)                  00002810
ISN 0217          CALL DATOUT(CEIK   ,8HCEIK     ,NSP2,UNIT,IER)                 00002820
ISN 0218          CALL DATOUT(CEIKF  ,8HCEIKF    ,NSP2,UNIT,IER)                 00002830
ISN 0219          CALL DATOUT(SC     ,8HSC       ,NSP2,UNIT,IER)                 00002840
ISN 0220          CALL DATOUT(KUN    ,8HKUN      ,NSP2,UNIT,IER)                 00002850
ISN 0221          DO 200 K=1,8                                                   00002860
ISN 0222            CALL DATOUT(FSPRNG(1,K),8HFSPRNG  ,NSP2,UNIT,IER)            00002870
ISN 0223      200 CONTINUE                                                       00002880
ISN 0224          NVCH2 = 2*NVCH                                                 00002890
ISN 0225          CALL DATOUT(VOL    ,8HVOL      ,NVCH2,UNIT,IER)                00002900
ISN 0226          DO 300  K = 1,3                                                00002910
ISN 0227            CALL DATOUT(DLVOL (1,K),8HDLVOL   ,NVCH2,UNIT,IER)           00002920
ISN 0228      300 CONTINUE                                                       00002930
            C                                                                    00002940
            C                                                                    00002950
            C                                                                    00002960
ISN 0229          CALL DATOUT(XDOTAP,8HXDOTAP   ,2,UNIT,IER)                     00002970
ISN 0230          CALL DATOUT(YDOTAP,8HYDOTAP   ,2,UNIT,IER)                     00002980
ISN 0231          CALL DATOUT(ZDOTAP,8HZDOTAP   ,2,UNIT,IER)                     00002990
ISN 0232          CALL DATOUT(ETOTTO,8HETOTTO   ,2,UNIT,IER)                     00003000
ISN 0233          CALL DATOUT(XETOTL,8HXETOTL   ,2,UNIT,IER)                     00003010
ISN 0234          CALL DATOUT(KETOTL,8HKETOTL   ,2,UNIT,IER)                     00003020
ISN 0235          CALL DATOUT(PETOTL,8HPETOTL   ,2,UNIT,IER)                     00003030
ISN 0236          CALL DATOUT(SETOTL,8HSETOTL   ,2,UNIT,IER)                     00003040
ISN 0237          CALL DATOUT(DETOTL,8HDETOTL   ,2,UNIT,IER)                     00003050
```

```
ISN 0238        CALL DATOUT(CETOTL,8HCETOTL  ,2,UNIT,IER)        00003060
ISN 0239        CALL DATOUT(FETOTL,8HFETOTL  ,2,UNIT,IER)        00003070
ISN 0240        CALL DATOUT(INGSCT,8HINGSCT  ,1,UNIT,IER)        00003080
ISN 0241        CALL CLSOUT(UNIT)                                00003090
ISN 0242        RETURN                                           00003100
ISN 0243        END                                              00003110
```

```
**********************************************************************************
*                                                                                *
*          THIS DOCUMENT SHALL NOT BE REPRODUCED NOR SHALL THE INFORMATION CONTAINED          *
*                                                                                *
*          THEREIN BE USED BY OR DISCLOSED TO OTHERS EXCEPT AS EXPRESSLY AUTHORIZED BY          *
*                                                                                *
*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.          *
*                                                                                *
**********************************************************************************
```


```
      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334SHX   AT LEVEL 002 AS OF 05/17/78
  ISN 0002          SUBROUTINE SHELLX(DARRAY,KEY,N)                         00000010
              C                                                             00000015
  ISN 0003          IMPLICIT REAL*8(A-H,O-Z)                                00000020
  ISN 0004          INTEGER*2 N                                             00000025
              C                                                             00000030
              C                                                             00000040
              C                                                             00000050
              C                                                             00000060
  ISN 0005          DIMENSION DARRAY(1),KEY(1)                              00000070
              C                                                             00000080
  ISN 0006          IFIRST = 1                                              00000090
              C                                                             00000100
  ISN 0007       10 K = IFIRST - 1                                          00000110
  ISN 0008          DO 20 I=IFIRST, N                                       00000120
  ISN 0009          K = K + 1                                               00000130
  ISN 0010          IF(KEY(K)) 20,20,40                                     00000140
  ISN 0011       20 CONTINUE                                                00000150
              C                                                             00000160
              C                                                             00000170
  ISN 0012          DO 30 I=1, N                                            00000180
  ISN 0013       30 KEY(I) = -KEY(I)                                        00000190
  ISN 0014          RETURN                                                  00000200
              C                                                             00000210
              C                                                             00000220
  ISN 0015       40 IFIRST = K                                              00000230
  ISN 0016          TEMP = DARRAY(K)                                        00000240
  ISN 0017          GO TO 60                                                00000250
              C                                                             00000260
              C                                                             00000270
  ISN 0018       50 DARRAY(K) = DARRAY(IK)                                  00000280
  ISN 0019          K = IK                                                  00000290
              C                                                             00000300
              C                                                             00000310
  ISN 0020       60 IK = KEY(K)                                             00000320
  ISN 0021          KEY(K) = -IK                                            00000330
              C                                                             00000340
              C     IK MUST BE COMPARED WITH IFIRST.                        00000350
              C                                                             00000360
  ISN 0022          IF(IK - IFIRST) 50,70,50                                00000370
              C                                                             00000380
```

```
              C                                                           00000390
ISN 0023          70 DARRAY(K) = TEMP                                     00000400
ISN 0024             GO TO 10                                             00000410
ISN 0025             END                                                  00000420
```

```
****************************************************************************************
*                                                                                      *
*          THIS DOCUMENT SHALL NOT BE REPRODUCED NOR SHALL THE INFORMATION CONTAINED   *
*                                                                                      *
*          THEREIN BE USED BY OR DISCLOSED TO OTHERS EXCEPT AS EXPRESSLY AUTHORIZED BY *
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*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                *
*                                                                                      *
****************************************************************************************
```


```
COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                   SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
      C         DATA SET D2334SHM   AT LEVEL 002 AS OF 07/19/78
            SUBROUTINE SHELLM(KEY,M,N)
            INTEGER*2 N
            DIMENSION KEY(1),M(1)
            IFIRST = 1
         10 K = IFIRST - 1
            DO 20 I=IFIRST, N
            K = K + 1
            IF(KEY(K)) 20,20,40
         20 CONTINUE
            DO 30 I=1, N
         30 KEY(I) = -KEY(I)
            RETURN
         40 IFIRST = K
            MTEMP = M(K)
            GO TO 60
         50 M(K) = M(IK)
            K = IK
         60 IK = KEY(K)
            KEY(K) = -IK
            IF(IK - IFIRST) 50,70,50
         70 M(K) = MTEMP
            GO TO 10
            END
```

```
ISN 0192          PYJ(IJ) = PTEMP(3)                                          00003060
ISN 0193          PZJ(IJ) = PTEMP(4)                                          00003070
ISN 0194          SF35(IJ)=PTEMPM(1)                                          00003080
ISN 0195          SF26(IJ)=PTEMPM(2)                                          00003090
ISN 0196          SF35J(IJ)=PTEMPM(3)                                         00003100
ISN 0197          SF26J(IJ)=PTEMPM(4)                                         00003110
ISN 0198     6120 CONTINUE                                                    00003120
             C                                                                00003130
             C    CARDS 0800                                                  00003140
             C                                                                00003150
ISN 0199     6112 DO 6111 IJ=1,NB                                             00003160
ISN 0200          IJUB(IJ)=0                                                  00003170
ISN 0201     6111 DB(IJ)=0.                                                   00003180
ISN 0202          IF(NUB.EQ.0) GO TO 6110                                     00003190
ISN 0204          DO 6114 JI=1,NUB                                            00003200
ISN 0205          READ 6116,M,I,N,J,IJTEMP,DBTEMP                             00003210
ISN 0206     6116 FORMAT(2(I2,I3),I5,E10.0)                                   00003220
ISN 0207          DO 6118 IJ=1,NB                                             00003230
ISN 0208          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00003240
                 1 GO TO 6119                                                 00003250
ISN 0210     6118 CONTINUE                                                    00003260
ISN 0211     6119 IJUB(IJ)=IJTEMP                                             00003270
ISN 0212          DB(IJ)=DBTEMP                                               00003280
ISN 0213     6114 CONTINUE                                                    00003290
             C                                                                00003300
             C    CARD 0900                                                   00003310
             C                                                                00003320
ISN 0214     6110 IF(NOLEO.EQ.0) GO TO 6210                                   00003330
ISN 0216          READ 5301,ALPHAP                                            00003340
ISN 0217          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),     00003350  6211
                 1 EOLEO(IJ),FAO(IJ),FAA(IJ),EXPOLE(IJ),YMAX(IJ),IJ=1,NOLEO)  00003360
ISN 0218          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),     00003370  6211
                 1 BOLEO(IJ),BROLEO(IJ),XKEXT(IJ),XKCOMP(IJ),FCOUL(IJ),IJ=1,NOLEO)  00003380  6211 FORMAT (2(I2,I3)),5E10.0)
ISN 0219     6210 READ 5600,DAMPC                                             00003390
ISN 0220     5600 FORMAT(E10.0)                                               00003400
             C                                                                00003410
             C     DAMPC=DAMPING COEFF. FOR ALL BEAMS                         00003420
             C     NO STANDARD DAMPC VALUE AS OF 3/79 VALUE MUST BE INPUT     00003430
             C     IF ND.NE.0 SET DESIRED CBAR TO VALUE READ IN               00003440
             C                                                                00003450
ISN 0221          CDUM=DAMPC                                                  00003460
ISN 0222          DO 5549 IJ=1,NB                                             00003470
ISN 0223     5549 CBAR(IJ) = CDUM                                             00003480
             C                                                                00003490
             C    CARDS 0901 AND UP                                           00003500
             C                                                                00003510
ISN 0224          IF(ND.EQ.0) GO TO 5543                                      00003520
ISN 0226          DO 5544 JI=1,ND                                             00003530
ISN 0227          READ 5547,M,I,N,J,CDUM                                      00003540
ISN 0228     5547 FORMAT(2(I2,I3),E10.0)                                      00003550
ISN 0229          DO 5544 IJ=1,NB                                             00003560
ISN 0230          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00003570
                 1 CBAR(IJ) = CDUM                                            00003580
```

Subroutine 'INPUT'

ND

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DTIC

AD-A055 898 LOCKHEED-CALIFORNIA CO BURBANK F/G 1/2
GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MAN--ETC(U)
FEB 78 M A GAMON DOT-FA75WA-3707
UNCLASSIFIED LR-28307-VOL-1 FAA/RD-77/189-VOL-1 NL

SUPPLEMENTARY

INFORMATION

AD-A055 898

ERRATA SHEET

Report No. FAA-RD-77-189, I

PROGRAM "KRASH" THEORY

1. Delete complete Appendix A, Program Listing, and replace with enclosed Appendix A (Revised), Program Listing, pages A-2 through A-202.

2. The enclosed change (yellow sheet) to the listing, Subroutine 'INPUT', is necessary if it is desired to model more than one oleo strut. Refer to Page A-130.

Released September 28, 1979

APPENDIX A (REVISED)

```
LEVEL 21.8 ( JUN 74 )                OS/360  FORTRAN H                    DATE  79.177/14.03.20

     **************************************************************************************
     *                                                                                    *
     *                                  PROGRAM LISTING                                   *
     *                                                                                    *
     *               LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.         *
     *                                                                                    *
     **************************************************************************************

          COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                             SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C        DATA SET D2334SS    AT LEVEL 001 AS OF 06/26/79
              C        DATA SET D2334MAIN  AT LEVEL 011 AS OF 06/25/79
              C        DATA SET D2332GMN   AT LEVEL 002 AS OF 05/02/78
              C        DATA SET D2332FMN   AT LEVEL 002 AS OF 02/09/78
              C
ISN 0002            IMPLICIT REAL*8 (A-H,O-Z)
ISN 0003            REAL*8 KUN, CASEIN, CASOUT, MINDT
ISN 0004            REAL*4 ENGSMY(6,200),PERCNT(6),ETIME(200)
ISN 0005            INTEGER*4 TITLE(40),STOP,RUNIN,RUNOUT,BPL(100,3)
ISN 0006            INTEGER*2 N1,N3,IJPR,NN,IBS,JBS,IG,JG,IEER,IESE,IEPSE,IEDE,IEPDE
ISN 0007            INTEGER*2 IECE,IEPCE,IEFE,IEPFE,IEDEV,IETOT
ISN 0008            INTEGER*2 MG(150),NG(150),INP(50),MNP(50)
ISN 0009            INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)
ISN 0010            INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                   *       JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),
                   *       JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),
                   *       NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0011            DIMENSION DEV(200)
ISN 0012            DIMENSION N3(150,6),
                   1 VEE2(6,150)
ISN 0013            COMMON/INPR/ NDRI,NSP
ISN 0014            COMMON/MADE/KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,
                   1 TPL(100),BPL,KPL
ISN 0015            COMMON/MACF/ IBS(40),FSPOP(40),SCP(40), JBS(40),
                   1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                   2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0016            COMMON/MACFIN/ TMAX,IPRINT
ISN 0017            COMMON/MAPR/ ETOTTO,ENGSMY,INGSCT
ISN 0018            COMMON/MAPR1/ DEV,ETIME,IEER,IESE,IEPSE,IEDE,IEPDE,IECE,IEPCE,
                   1 IEFE,IEPFE,IEDEV,IETOT
ISN 0019            COMMON/NP00I4/ NNP
ISN 0020            COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0021            COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),
                   1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                   2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                   3 YIMNPL(50),ZIMNPL(50)
ISN 0022            COMMON                    XX(80),XY(80),XZ(80),XL(80),XM(80),
                   1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),
                   2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),
                   5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),
                   6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),
```

```
                  7 PHIOLD(80),THEOLD(80),PSIOLD(80),
                  8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),
                  9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),
                  A TKR(200),TPEN(80),DTHALF,
                  B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT
ISN 0023            COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD
ISN 0024            COMMON/MCFIII/ SYMFLG
ISN 0025            COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                  1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                  2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                  3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                  4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                  5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                  6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                  7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                  8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                  9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                  A CEIKF(40),
                  B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                  C NM,NB,I,J,IG(150),JG(150),
                  D N1(900),NN(40),IJPR(150)
ISN 0026            COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                  *         JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,
                  *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0027            COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)
ISN 0028            COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR
ISN 0029            EQUIVALENCE (N1(1),N3(1)),(VEE(1),VEE2(1))
ISN 0030            DATA STOP/'END '/
ISN 0031            MAXNM = 80
ISN 0032            IPC = 0
ISN 0033            MAXIGS = 150
ISN 0034            MAXTBL = 180
ISN 0035            CALL ECHO
ISN 0036            CALL ECHO
ISN 0037          1 CALL INPUT
ISN 0038            IF(TITLE(1).EQ.STOP) GO TO 1000
ISN 0040            IF(DELTAT.LE.0.) GO TO 1000
ISN 0042            IF(NM.LE.0) GO TO 1000
              C
              C     THE INPUT PARAMETER RUNMOD CONTROLS THE TYPE OF CASE TO BE RUN
              C     ACCORDING TO THE FOLLOWING OPTIONS:
              C
              C
              C     RUNMOD           DESCRIPTION
              C
              C       0.        INPUT FULL AIRPLANE DATA SET,STANDARD EXECUTION
              C
              C       1.        INPUT 1/2 AIRPLANE DATA SET,SYMMETRICAL IMPACT
              C
              C       2.        INPUT 1/2 AIRPLANE DATA SET AND THE PROGRAM WILL
              C                 GENERATE AND PRINT THE FULL SYMMETRICAL DATA SET
              C
              C       3.        SAME AS 2 WITH COMPLETE DATA SET PUNCH
```

```
              C                                                           00000930
              C       4.      SAME AS 2 ONLY INCLUDE SYMMETRICAL CONSTRAINTS IN DE. 00000940
              C                                                           00000950
              C                                                           00000960
              C       REWIND NECESSARY UNITS IF PLOTS ARE REQUESTED       00000970
              C                                                           00000980
  ISN 0044            IF(NMEP .GT. 0) REWIND 1                            00000990
  ISN 0046            IF(NNEP .GT. 0) REWIND 2                            00001000
  ISN 0048            IF(NBFP .GT. 0) REWIND 3                            00001010
  ISN 0050            IF(NBDP .GT. 0) REWIND 4                            00001020
  ISN 0052            IF(NSEP .GT. 0) REWIND 8                            00001030
  ISN 0054            IF(NDRP .GT. 0) REWIND 9                            00001040
  ISN 0056            IF(NENP.GT.0) REWIND 11                             00001050
  ISN 0058            REWIND 10                                           00001060
  ISN 0059            IF(NSTP .GT. 0) REWIND 13                           00001070
              C                                                           00001080
              C       SET PLOT COUNTERS TO ZERO                           00001090
              C                                                           00001100
  ISN 0061            NMEW = 0                                            00001110
  ISN 0062            NNEW = 0                                            00001120
  ISN 0063            NBFW = 0                                            00001130
  ISN 0064            NBDW = 0                                            00001140
  ISN 0065            NSEW = 0                                            00001150
  ISN 0066            NDRW = 0                                            00001160
  ISN 0067            NSTW = 0                                            00001170
  ISN 0068            NENW=0                                              00001180
  ISN 0069            NPRINT = 0                                          00001190
              C                                                           00001200
              C       SET ENERGY ERROR MESSAGE INDICES TO ZERO            00001210
              C                                                           00001220
  ISN 0070            IEER=0                                              00001230
  ISN 0071            IETOT=0                                             00001240
  ISN 0072            IESE=0                                              00001250
  ISN 0073            IEPSE=0                                             00001260
  ISN 0074            IEDE=0                                              00001270
  ISN 0075            IEPDE=0                                             00001280
  ISN 0076            IECE=0                                              00001290
  ISN 0077            IEPCE=0                                             00001300
  ISN 0078            IEFE=0                                              00001310
  ISN 0079            IEPFE=0                                             00001320
  ISN 0080            IEDEV=0                                             00001330
  ISN 0081            SYMFLG = 0.                                         00001340
  ISN 0082            PUNMOD = 0.                                         00001350
  ISN 0083            IF(RUNMOD.EQ.1.) SYMFLG = 1.                        00001360
  ISN 0085            IF(RUNMOD.EQ.3.) PUNMOD = 1.                        00001370
  ISN 0087            IF(RUNMOD.EQ.4.) SYMFLG = 2.                        00001380
  ISN 0089            IF(RUNMOD.GE.2.) CALL GENMOD                        00001390
  ISN 0091            CALL INPRNT                                         00001400
  ISN 0092            DT2 = 2.0*DELTAT                                    00001410
  ISN 0093            DTHALF = .5*DELTAT                                  00001420
  ISN 0094            DO 130 I = 1,NM                                     00001430
  ISN 0095              XI1(I) = YI(I)*ZI(I)-YZI(I)*YZI(I)                00001440
  ISN 0096              XI2(I) = XYI(I)*ZI(I)+XZI(I)*YZI(I)               00001450
```

```
ISN 0097          XI3(I) = XYI(I)*YZI(I)+YI(I)*XZI(I)                       00001460
ISN 0098          XI4(I) = XI(I)*YZI(I)+XZI(I)*XYI(I)                       00001470
ISN 0099          XI5(I) = XI(I)*ZI(I)-XZI(I)*XZI(I)                        00001480
ISN 0100          XI6(I) = XI(I)*YI(I)-XYI(I)*XYI(I)                        00001490
ISN 0101      130 DELI(I) = 1.0/(XI(I)*XI1(I)-XYI(I)*XI2(I)-XZI(I)*XI3(I))  00001500
ISN 0102          DO 154 I=1,200                                            00001510
            C     COUNTERS FOR RUPTURE AND YIELD SUMMARY ARE SET TO ZERO    00001520
ISN 0103          TKR(I)=0.                                                 00001530
ISN 0104          DO 154 J=1,4                                              00001540
ISN 0105          KRBEAM(J,I)=0.                                            00001550
ISN 0106      154 CONTINUE                                                  00001560
ISN 0107          DO 155 I=1,200                                            00001570
ISN 0108          TSP(I)=0.                                                 00001580
ISN 0109          DO 155 J=1,5                                              00001590
ISN 0110          EXSP(J,I)=0.                                              00001600
ISN 0111          KKSP(J,I)=0.                                              00001610
ISN 0112      155 CONTINUE                                                  00001620
ISN 0113          IF (RUNIN .EQ. 0) GO TO 5                                 00001630
ISN 0115            CALL RC                                                 00001640
ISN 0116            CALL RSIN(CASEIN,RUNIN,MSECIN)                          00001650
ISN 0117            PRINT 5000,CASEIN,RUNIN,MSECIN                          00001660
ISN 0118            CALL DOAIJ                                              00001670
ISN 0119            INGOLD = INGSCT                                         00001680
ISN 0120            GO TO 270                                               00001690
ISN 0121        5 CONTINUE                                                  00001700
ISN 0122     5000 FORMAT(1H0,2X,'****DATA MANAGEMENT RESTART ROUTINES INVOKED****'   00001710
                1 / 10X,'REQUESTED CASE TITLE    - ',A8                     00001720
                2 / 10X,'REQUESTED RUN NUMBER    - ',I10                    00001730
                3 / 10X,'REQUESTED RESTART TIME - ',I10 / 1H0)              00001740
ISN 0123          INGSCT = 0                                                00001750
ISN 0124          INGOLD = 0                                                00001760
ISN 0125          KRCONT = 0                                                00001770
ISN 0126          KPEN=0                                                    00001780
ISN 0127          KKONT=0                                                   00001790
ISN 0128          KPL=0                                                     00001800
            C (26)                                                          00001810
            C ZERO ARRAYS                                                   00001820
ISN 0129          TIME = 0.0                                                00001830
ISN 0130          NM9 = 9*NM                                                00001840
ISN 0131          DO 140 I = 1,NM9                                          00001850
ISN 0132      140 BIJ(I) = 0.0                                              00001860
ISN 0133          DO 150 I = 1,NM                                           00001870
ISN 0134          DX(I) = 0.0                                               00001880
ISN 0135          DY(I) = 0.0                                               00001890
ISN 0136          DZ(I) = 0.0                                               00001900
ISN 0137          XX(I) = 0.0                                               00001910
ISN 0138          XY(I) = 0.0                                               00001920
ISN 0139          XZ(I) = 0.0                                               00001930
ISN 0140          XL(I) = 0.0                                               00001940
ISN 0141          XM(I) = 0.0                                               00001950
ISN 0142          XN(I) = 0.0                                               00001960
ISN 0143          XIMP(I)=0.                                                00001970
ISN 0144          YIMP(I)=0.                                                00001980
```

```
      ZIMP(I)=0.
      DPX(I) = 0.0
      DPY(I) = 0.0
      DPZ(I) = 0.0
      DPL(I) = 0.0
      DPM(I) = 0.0
      DPN(I) = 0.0
      DPIN(I) = 0.0
      DQIN(I) = 0.0
      DRIN(I) = 0.0
      XACC(I)=0.0
      YACC(I)=0.0
      ZACC(I)=0.0
  150 CONTINUE
      DO 156 I=1,600
      KRFLAG(I)=0
  156 CONTINUE
      DO 157 I=1,NNP
      XIMPNP(I)=0.
      YIMPNP(I)=0.
      ZIMPNP(I)=0.
  802 FORMAT(/1X,'MAIN',4E15.6)
  157 CONTINUE
      DO 152 IKM=1,NSP
      IBS(IKM)= 0
      NN(IKM) = 0
      SC(IKM) = 0.0
      CEIK(IKM) = 0.0
      CEIKF(IKM) = 0.
      SBAR(IKM) = 0.
      KUN(IKM) = 0.
      FSPBAR(IKM) = 0.0
C       EXTERNAL SPRING SUMMARY TERMS 3/79
      FSPOP(IKM)=0.
      SCP(IKM)=0.
      JBS(IKM)=0
      STEMP1(IKM)=0.
      STEMP2(IKM)=0.
      STEMP3(IKM)=0.
      STEMP4(IKM)=0.
      STEMP5(IKM)=0.
  152 CONTINUE
      DO 160 IJ = 1,NB
      SEIJ(IJ) = 0.0
      DEIJ(IJ) = 0.0
      KFL26(IJ) = 0
      KFL35(IJ) = 0
      FL26I(IJ)=0
      FL26J(IJ)=0
      FL35I(IJ)=0
      FL35J(IJ)=0
      DO 160 L = 1,6
      SUMDF(L,IJ) = 0.0
```

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ISN 0197          N3(IJ,L) = 0
ISN 0198      160 VEE2(L,IJ) = 0.0
ISN 0199          DO 165 J = 1,3
ISN 0200          DO 165 K = 1,3
ISN 0201      165 VEEDOT(J,K) = 0.0
            C DO INITIAL CONDITIONS
ISN 0202          CALL IC
            C DO ALL THE (AIJ) INTO DIJ
ISN 0203          CALL DOAIJ
ISN 0204          CALL DERIV
ISN 0205          CALL PRINT
ISN 0206          NPRINT = 1
ISN 0207          IPC = 0
ISN 0208          DO 200 I = 1,NM
            C PRESET OLD VALUES
ISN 0209          PINO(I) = 0.0
ISN 0210          QINO(I) = 0.0
ISN 0211          RINO(I) = 0.0
ISN 0212          XOLD(I) = X(I)
ISN 0213          YOLD(I) = Y(I)
ISN 0214          ZOLD(I) = Z(I)
ISN 0215          PHIOLD(I) = PHI(I)
ISN 0216          THEOLD(I) = THETA(I)
ISN 0217          PSIOLD(I) = PSI(I)
ISN 0218          POLD(I) = P(I)
ISN 0219          QOLD(I) = Q(I)
ISN 0220          ROLD(I) = R(I)
ISN 0221          UOLD(I) = U(I)
ISN 0222          VOLD(I) = V(I)
ISN 0223          WOLD(I) = W(I)
ISN 0224          XAFOLD(I)=XACF(I)
ISN 0225          YAFOLD(I)=YACF(I)
ISN 0226          ZAFOLD(I)=ZACF(I)
ISN 0227          XIMPOL(I)=XIMP(I)
ISN 0228          YIMPOL(I)=YIMP(I)
ISN 0229          ZIMPOL(I)=ZIMP(I)
            C DO 1ST STEP EULER
ISN 0230          DPIN(I) = DELTAT*P(I)
ISN 0231          DQIN(I) = DELTAT*Q(I)
ISN 0232          DRIN(I) = DELTAT*R(I)
ISN 0233          PIN(I) = DPIN(I)
ISN 0234          QIN(I) = DQIN(I)
ISN 0235          RIN(I) = DRIN(I)
ISN 0236          P(I) = P(I)+DELTAT*PDOT(I)
ISN 0237          Q(I) = Q(I)+DELTAT*QDOT(I)
ISN 0238          R(I) = R(I)+DELTAT*RDOT(I)
ISN 0239          U(I) = U(I)+DELTAT*UDOT(I)
ISN 0240          V(I) = V(I)+DELTAT*VDOT(I)
ISN 0241          W(I) = W(I)+DELTAT*WDOT(I)
ISN 0242          XACF(I)=XACF(I)+DELTAT*XACFD(I)
ISN 0243          YACF(I)=YACF(I)+DELTAT*YACFD(I)
ISN 0244          ZACF(I)=ZACF(I)+DELTAT*ZACFD(I)
ISN 0245          XIMP(I)=XIMP(I)+DELTAT*XACF(I)
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ISN 0246          YIMP(I)=YIMP(I)+DELTAT*YACF(I)                            00003050
ISN 0247          ZIMP(I)=ZIMP(I)+DELTAT*ZACF(I)                            00003060
ISN 0248          DX(I) = DELTAT*XDOT(I)                                    00003070
ISN 0249          X(I) = X(I)+DX(I)                                         00003080
ISN 0250          DY(I) = DELTAT*YDOT(I)                                    00003090
ISN 0251          Y(I) = Y(I)+DY(I)                                         00003100
ISN 0252          DZ(I) = DELTAT*ZDOT(I)                                    00003110
ISN 0253          Z(I) = Z(I)+DZ(I)                                         00003120
ISN 0254          PHI(I) = PHI(I) + DELTAT*PHIDOT(I)                        00003130
ISN 0255          THETA(I) = THETA(I) + DELTAT*THEDOT(I)                    00003140
ISN 0256          PSI(I) = PSI(I) + DELTAT*PSIDOT(I)                        00003150
ISN 0257      200 CONTINUE                                                  00003160
ISN 0258          IF(NNP.EQ.0) GO TO 190                                    00003170
ISN 0260          DO 210 J=1,NNP                                            00003180
ISN 0261          XANPFO(J)=XACNPF(J)                                       00003190
ISN 0262          YANPFO(J)=YACNPF(J)                                       00003200
ISN 0263          ZANPFO(J)=ZACNPF(J)                                       00003210
ISN 0264          XIMNPL(J)=XIMPNP(J)                                       00003220
ISN 0265          YIMNPL(J)=YIMPNP(J)                                       00003230
ISN 0266          ZIMNPL(J)=ZIMPNP(J)                                       00003240
ISN 0267          XACNPF(J)=XACNPF(J)+DELTAT*XNPFD(J)                       00003250
ISN 0268          YACNPF(J)=YACNPF(J)+DELTAT*YNPFD(J)                       00003260
ISN 0269          ZACNPF(J)=ZACNPF(J)+DELTAT*ZNPFD(J)                       00003270
ISN 0270          XIMPNP(J)=XIMPNP(J)+DELTAT*XACNPF(J)                      00003280
ISN 0271          YIMPNP(J)=YIMPNP(J)+DELTAT*YACNPF(J)                      00003290
ISN 0272          ZIMPNP(J)=ZIMPNP(J)+DELTAT*ZACNPF(J)                      00003300
ISN 0273      210 CONTINUE                                                  00003310
ISN 0274      190 TIME = TIME+DT2-DELTAT                                    00003320
ISN 0275          IPC = IPC+1                                               00003330
ISN 0276          CALL DERIV                                                00003340
ISN 0277          IF(IPC-IPRINT) 310,260,260                                00003350
ISN 0278      260 ITIME = TIME*1000 + .5                                    00003360
ISN 0279          IF (MSCOUT(1).LE.0 .OR. MSCOUT(1).GT.ITIME) GO TO 270     00003370
ISN 0281            CALL RSOUT(CASOUT,RUNOUT,ITIME)                         00003380
ISN 0282            PRINT 4000,MSCOUT(1),ITIME,TIME,CASOUT,RUNOUT           00003390
ISN 0283            DO 265 I1=1,4                                           00003400
ISN 0284      265     MSCOUT(I1) = MSCOUT(I1+1)                             00003410
ISN 0285            MSCOUT(5) = 0                                           00003420
ISN 0286     4000 FORMAT(1H0,2X,'***DATA MANAGEMENT CHECKPOINT ROUTINES INVOKED***' 00003430
                1 / 10X,'REQUESTED TIME - ',I10      / 10X,'   ACTUAL TIME - ',I1000003440
                2 / 10X,'      REAL TIME - ',1PE10.4 / 10X,'    CASE TITLE - ',A8  00003450
                3 / 10X,'         RUN NO. - ',I10 / 1H0)                    00003460
ISN 0287      270 CALL PRINT                                                00003470
ISN 0288          NPRINT = 1                                                00003480
ISN 0289          IPC = 0                                                   00003490
ISN 0290      310 CONTINUE                                                  00003500
                C PREDICT, MOVE DOWN, AND DO DELTA'S                        00003510
ISN 0291      280 DO 300 I = 1,NM                                           00003520
ISN 0292          T = PINO(I)+DT2*P(I)                                      00003530
ISN 0293          PINO(I) = PIN(I)                                          00003540
ISN 0294          PIN(I) = T                                                00003550
ISN 0295          DPIN(I) = PIN(I)-PINO(I)                                  00003560
ISN 0296          T = QINO(I)+DT2*Q(I)                                      00003570
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ISN 0297          QINO(I) = QIN(I)                                  00003580
ISN 0298          QIN(I) = T                                        00003590
ISN 0299          DQIN(I) = QIN(I)-QINO(I)                          00003600
ISN 0300          T = RINO(I)+DT2*R(I)                              00003610
ISN 0301          RINO(I) = RIN(I)                                  00003620
ISN 0302          RIN(I) = T                                        00003630
ISN 0303          DRIN(I) = RIN(I)-RINO(I)                          00003640
ISN 0304          T = XOLD(I)+DT2*XDOT(I)                           00003650
ISN 0305          XOLD(I) = X(I)                                    00003660
ISN 0306          X(I) = T                                          00003670
ISN 0307          DX(I) = X(I)-XOLD(I)                              00003680
ISN 0308          T = YOLD(I)+DT2*YDOT(I)                           00003690
ISN 0309          YOLD(I) = Y(I)                                    00003700
ISN 0310          Y(I) = T                                          00003710
ISN 0311          DY(I) = Y(I)-YOLD(I)                              00003720
ISN 0312          T = ZOLD(I)+DT2*ZDOT(I)                           00003730
ISN 0313          ZOLD(I) = Z(I)                                    00003740
ISN 0314          Z(I) = T                                          00003750
ISN 0315          DZ(I) = Z(I)-ZOLD(I)                              00003760
ISN 0316          T = PHIOLD(I)+DT2*PHIDOT(I)                       00003770
ISN 0317          PHIOLD(I) = PHI(I)                                00003780
ISN 0318          PHI(I) = T                                        00003790
ISN 0319          T = THEOLD(I)+DT2*THEDOT(I)                       00003800
ISN 0320          THEOLD(I) = THETA(I)                              00003810
ISN 0321          THETA(I) = T                                      00003820
ISN 0322          T = PSIOLD(I)+DT2*PSIDOT(I)                       00003830
ISN 0323          PSIOLD(I) = PSI(I)                                00003840
ISN 0324          PSI(I) = T                                        00003850
ISN 0325          T = POLD(I)+DT2*PDOT(I)                           00003860
ISN 0326          POLD(I) = P(I)                                    00003870
ISN 0327          P(I) = T                                          00003880
ISN 0328          T = QOLD(I)+DT2*QDOT(I)                           00003890
ISN 0329          QOLD(I) = Q(I)                                    00003900
ISN 0330          Q(I) = T                                          00003910
ISN 0331          T = ROLD(I)+DT2*RDOT(I)                           00003920
ISN 0332          ROLD(I) = R(I)                                    00003930
ISN 0333          R(I) = T                                          00003940
ISN 0334          T = UOLD(I)+DT2*UDOT(I)                           00003950
ISN 0335          UOLD(I) = U(I)                                    00003960
ISN 0336          U(I) = T                                          00003970
ISN 0337          T = VOLD(I)+DT2*VDOT(I)                           00003980
ISN 0338          VOLD(I) = V(I)                                    00003990
ISN 0339          V(I) = T                                          00004000
ISN 0340          T = WOLD(I)+DT2*WDOT(I)                           00004010
ISN 0341          WOLD(I) = W(I)                                    00004020
ISN 0342          W(I) = T                                          00004030
ISN 0343          T=XAFOLD(I)+DT2*XACFD(I)                          00004040
ISN 0344          XAFOLD(I)=XACF(I)                                 00004050
ISN 0345          XACF(I)=T                                         00004060
ISN 0346          T=XIMPOL(I)+DT2*XACF(I)                           00004070
ISN 0347          XIMPOL(I)=XIMP(I)                                 00004080
ISN 0348          XIMP(I)=T                                         00004090
ISN 0349          T=YAFOLD(I)+DT2*YACFD(I)                          00004100
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ISN 0350          YAFOLD(I)=YACF(I)
ISN 0351          YACF(I)=T
ISN 0352          T=YIMPOL(I)+DT2*YACF(I)
ISN 0353          YIMPOL(I)=YIMP(I)
ISN 0354          YIMP(I)=T
ISN 0355          T=ZAFOLD(I)+DT2*ZACFD(I)
ISN 0356          ZAFOLD(I)=ZACF(I)
ISN 0357          ZACF(I)=T
ISN 0358          T=ZIMPOL(I)+DT2*ZACF(I)
ISN 0359          ZIMPOL(I)=ZIMP(I)
ISN 0360          ZIMP(I)=T
ISN 0361      800 FORMAT(/'MAIN',2X,'I=',I5,2X,'ZAFOLD=',E15.6,2X,'ZACFD =',E15.6,
                 1 2X,'ZACF  =',E15.6,2X,'ZIMP  =',E15.6,2X,'ZIMPOL=',E15.6/)
ISN 0362      801 FORMAT(/6X,'J=',I5,2X,'ZANPFO=',E15.6,2X,'ZNPFD =',E15.6,2X,
                 1 'ZACNPF=',E15.6,2X,'ZIMPNP=',E15.6,2X,'ZIMNPL=',E15.6/)
ISN 0363      300 CONTINUE
ISN 0364          IF(NNP.EQ.0) GO TO 400
ISN 0366          DO 410 J=1,NNP
ISN 0367          T=XANPFO(J)+DT2*XNPFD(J)
ISN 0368          XANPFO(J)=XACNPF(J)
ISN 0369          XACNPF(J)=T
ISN 0370          T=XIMNPL(J)+DT2*XACNPF(J)
ISN 0371          XIMNPL(J)=XIMPNP(J)
ISN 0372          XIMPNP(J)=T
ISN 0373          T=YANPFO(J)+DT2*YNPFD(J)
ISN 0374          YANPFO(J)=YACNPF(J)
ISN 0375          YACNPF(J)=T
ISN 0376          T=YIMNPL(J)+DT2*YACNPF(J)
ISN 0377          YIMNPL(J)=YIMPNP(J)
ISN 0378          YIMPNP(J)=T
ISN 0379          T=ZANPFO(J)+DT2*ZNPFD(J)
ISN 0380          ZANPFO(J)=ZACNPF(J)
ISN 0381          ZACNPF(J)=T
ISN 0382          T=ZIMNPL(J)+DT2*ZACNPF(J)
ISN 0383          ZIMNPL(J)=ZIMPNP(J)
ISN 0384          ZIMPNP(J)=T
ISN 0385      410 CONTINUE
ISN 0386      400 CONTINUE
ISN 0387          IF(IEER.NE.1) GO TO 420
ISN 0389          PRINT 7100
ISN 0390     7100 FORMAT(1H1 // 1X,'TERMINATION DUE TO ENERGY ERROR MESSAGE')
ISN 0391     7201 IF(IESE.NE.1) GO TO 7202
ISN 0393          PRINT 7301
ISN 0394     7301 FORMAT(/ 1X,'26. IESE=1 TOTAL STRAIN ENERGY IS NEGATIVE')
ISN 0395     7202 IF(IEPSE.NE.1) GO TO 7203
ISN 0397          PRINT 7302
ISN 0398     7302 FORMAT(/ 1X,'27. IEPSE=1 ELEMENT STRAIN ENERGY EXCEEDS NTOL2',
                 *          ' VALUE')
ISN 0399     7203 IF(IEDE.NE.1) GO TO 7204
ISN 0401          PRINT 7303
ISN 0402     7303 FORMAT(/ 1X,'28. IEDE=1 TOTAL DAMPING ENERGY IS NEGATIVE')
ISN 0403     7204 IF(IEPDE.NE.1) GO TO 7205
ISN 0405          PRINT 7304
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ISN 0406      7304 FORMAT(/ 1X,'29. IEPDE=1 ELEMENT DAMPING ENERGY EXCEEDS NTOL2',   00004640
                 *        ' VALUE')                                                   00004650
ISN 0407      7205 IF(IECE.NE.1) GO TO 7206                                           00004660
ISN 0409           PRINT 7305                                                         00004670
ISN 0410      7305 FORMAT(/ 1X,'30. IECE=1 TOTAL CRUSHING ENERGY IS NEGATIVE')        00004680
ISN 0411      7206 IF(IEPCE.NE.1) GO TO 7207                                          00004690
ISN 0413           PRINT 7306                                                         00004700
ISN 0414      7306 FORMAT(/ 1X,'31. IEPCE=1 MASS CRUSHING ENERGY EXCEEDS NTOL2',      00004710
                 *        ' VALUE')                                                   00004720
ISN 0415      7207 IF(IEFE.NE.1) GO TO 7208                                           00004730
ISN 0417           PRINT 7307                                                         00004740
ISN 0418      7307 FORMAT(/ 1X,'32. IEFE=1 TOTAL FRICTION ENERGY IS NEGATIVE')        00004750
ISN 0419      7208 IF(IEPFE.NE.1) GO TO 7209                                          00004760
ISN 0421           PRINT 7308                                                         00004770
ISN 0422      7308 FORMAT(/ 1X,'33. IEPFE=1 MASS FRICTION ENERGY EXCEEDS NTOL2',      00004780
                 *        ' VALUE')                                                   00004790
ISN 0423      7209 IF(IEDEV.NE.1) GO TO 7210                                          00004800
ISN 0425           PRINT 7309                                                         00004810
ISN 0426      7309 FORMAT(/ 1X,'34. IEDEV=1 MASS DEVIATION EXCEEDS NTOL3 VALUE')      00004820
ISN 0427      7210 IF(IETOT.NE.1) GO TO 7211                                          00004830
ISN 0429           PRINT 7310                                                         00004840
ISN 0430      7310 FORMAT(/ 1X,'35. IETOT=1 TOTAL ENERGY CHANGE EXCEEDS NTOL1',       00004850
                 *        ' VALUE')                                                   00004860
ISN 0431      7211 GO TO 500                                                          00004870
ISN 0432       420 IF(TIME-TMAX) 190,190,500                                          00004880
ISN 0433       500 IF(KRCONT.LE.0) GO TO 4500                                         00004890
ISN 0435           PRINT 2000                                                         00004900
ISN 0436      2000 FORMAT(1H1 // 1X,'SUMMARY OF INTERNAL BEAM YIELDING ',             00004910
                 1 'AND RUPTURE'/ 18X,'BEAM',13X,'BEAM DIRECTION FOR',2X,             00004920
                 2 'TENSION(+) OR'/4X,'TIME',6X,'IJ',3X,'I',3X,'J',3X,'M',3X,'N',     00004930
                 3 3X,'YIELD',6X,'RUPTURE',2X,'COMPRESSION(-)'/)                      00004940
ISN 0437           DO 3500 JJ=1,KRCONT                                                00004950
ISN 0438           IJ = KRBEAM(1,JJ)                                                  00004960
ISN 0439           PRINT 3000,TKR(JJ),KRBEAM(1,JJ),IG(IJ),JG(IJ),MG(IJ),NG(IJ),       00004970
                 1 KRBEAM(2,JJ),KRBEAM(3,JJ),KRBEAM(4,JJ)                             00004980
ISN 0440      3500 CONTINUE                                                           00004990
ISN 0441      3000 FORMAT(1X,F9.6,3X,I3,4(2X,I2),5X,I1,11X,I1,10X,I2)                 00005000
ISN 0442      4500 IF(KKONT.LE.0) GO TO 5600                                          00005010
ISN 0444           PRINT 2500                                                         00005020
ISN 0445      2500 FORMAT(1H1//6X,'SUMMARY OF EXTERNAL SPRING LOADING AND UNLOADING'  00005030
                 1 //  10X,'TYPES;1=INITIAL LOADING 2=MAX.LOADING 3=UNLOAD TO ZERO    00005040
                 2 FORCE 4=INITIATION OF RELOAD'//10X,'NOTE:SPRING RELOADS AT ZERO    00005050
                 3 FORCE(SEQ.1,2,3,4) OR AT FINITE FORCE VALUE(SEQ.1,2,4)'            00005060
                 4 //      10X,'NOTE:INITIAL DEFLECTION IS FIRST IMPACT IF NYPE=1,    00005070
                 5 OTHERWISE IT IS POINT AT WHICH RELOADING OCCUR FOR NTYPE=4'        00005080
                 6 //1X,'TIME(SEC)',2X,'MASS',3X,'NODE',2X,'DIRECTION',               00005090
                 7 2X,'TYPE',3X,'INITIAL',9X,'MAXIMUM',15X,'UNLOADED'                 00005100
                 8 / 13X,'NO.',4X,'NO.',3X,'L=1,2,3',4X,'NO.' ,2X,                    00005110
                 9'DEFLECTION',3X,'FORCE',1X,'&/OR',1X,'DEFLECT',1X,'DEFLECT',        00005120
                 A 2X,'&',1X,'FORCE')                                                 00005130
ISN 0446           DO 3600 JJ=1,KKONT                                                 00005140
ISN 0447           PRINT 3100,TSP(JJ),KKSP(1,JJ),KKSP(2,JJ),KKSP(3,JJ),KKSP(4,JJ),    00005150
                 1 EXSP(1,JJ),EXSP(2,JJ),EXSP(3,JJ),EXSP(4,JJ),EXSP(5,JJ)             00005160
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ISN 0448      3600 CONTINUE
ISN 0449      3100 FORMAT(1X,F9.6,3X,3(I2,5X),2X,I2,3X,F8.4,2X,E10.2,2(2X,F8.4),2X,
                 1 E10.2)
              C
              C      SUMMARY TABLE FOR PLASTIC HINGE
              C
ISN 0450      5600 IF(KPL.LE.0) GO TO 5500
ISN 0452           PRINT 5610
ISN 0453      5610 FORMAT(//,1X,'SUMMARY OF PLASTIC HINGE FORMATIONS')
ISN 0454           PRINT 5620
ISN 0455      5620 FORMAT(/,17X,'BEAM',9X,'BEAM END'/4X,'TIME',5X,
                 1 'IJ  I  J  M  N',3X,'MASS NO.   DIRECTION')
ISN 0456           DO 5630 K=1,KPL
ISN 0457           TIMEPL=TPL(K)
ISN 0458           IJ=BPL(K,1)
ISN 0459           I=IG(IJ)
ISN 0460           J=JG(IJ)
ISN 0461           M=MG(IJ)
ISN 0462           N=NG(IJ)
ISN 0463           MNUMB=BPL(K,3)
ISN 0464           NDIREC=BPL(K,2)
ISN 0465           PRINT 5640,TIMEPL,IJ,I,J,M,N,MNUMB,NDIREC
ISN 0466      5640 FORMAT(1X,F9.6,2X,5I3,5X,I3,9X,I2)
ISN 0467      5630 CONTINUE
ISN 0468      5500 IF (KPEN.LE.0)  GO TO 6000
ISN 0470           PRINT 5501
ISN 0471      5501 FORMAT(1H1,7X,'CONTROL VOLUME PENETRATIONS' //)
ISN 0472           PRINT 5502
ISN 0473      5502 FORMAT(1H ,13X,'TIME',10X,'MASS' /)
ISN 0474           PRINT 5503,(TPEN(K),IPEN(K),K=1,KPEN)
ISN 0475      5503 FORMAT(1H ,10X,F10.5,I10)
              C*****PRINT ENERGY SUMMARY
ISN 0476      6000 PRINT 9
ISN 0477         9 FORMAT(1H1 // 1X,'SUMMARY OF ENERGY DISTRIBUTION' ///)
ISN 0478           PRINT 10
ISN 0479        10 FORMAT(10X,'PERCENT',2X,'PERCENT',5(11X,'PERCENT'),10X,'PERCENT'/
                 1 10X,'MAXIMUM',3X,'TOTAL',14X,'OF',4(16X,'OF'),15X,'OF'/11X,
                 2 'ENERGY',2X,'SYSTEM',3X,'KINETIC',2X,'CURRENT',1X,
                 3 'POTENTIAL',1X,'CURRENT',2X,'STRAIN',3X,'CURRENT',2X,
                 4 'DAMPING',2X,'CURRENT',1X,'CRUSHING',2X,'CURRENT',1X,
                 5 'FRICTION',1X,'CURRENT' / 2X,'TIME',3X,'DEVIATION',1X,'ENERGY',
                 6 5(3X,'ENERGY',4X,'TOTAL'),3X,'ENERGY',3X,'TOTAL' /)
              C    DTP = IPRINT*DELTAT
              C    TIME = -DTP
ISN 0480           INGO = INGOLD + 1
ISN 0481           DO 20 I = INGO,INGSCT
              C    TIME = TIME+DTP
              C    ITIME = TIME*1000 + .5
              C    IF (ITIME .LT. MSECIN) GO TO 20
ISN 0482           ETOT = 0.0
ISN 0483           DO 30 J = 1,6
ISN 0484        30 ETOT = ETOT+ENGSMY(J,I)
ISN 0485           PCTTO = ETOT/ETOTTO
```

```
ISN 0486          DO 40 J = 1,6                                                      00005700
ISN 0487       40 PERCNT(J) = ENGSMY(J,I)/ETOT                                       00005710
ISN 0488          PRINT 60, ETIME(I),DEV(I),PCTTO,(ENGSMY(J,I),PERCNT(J),J=1,6)      00005720
ISN 0489       60 FORMAT(1X,F6.5,2X,F9.6,2PF7.2,6(1PE11.3,2PF7.2))                   00005730
ISN 0490       20 CONTINUE                                                           00005740
ISN 0491          TMAX=TIME                                                          00005750
ISN 0492          CALL PREPLT(TPRINT,NM,NNP,NB,NSP,NDRI,MSECIN)                      00005760
ISN 0493          GO TO 1                                                            00005770
ISN 0494     1000 CONTINUE                                                           00005780
ISN 0495          STOP                                                               00005790
ISN 0496          END                                                                00005800
```

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LEVEL 21.8 ( JUN 74 )                    OS/360  FORTRAN H                          DATE  79.177/14.03.31

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       *                                                                                     *
       *            LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.              *
       *                                                                                     *
       ***************************************************************************************

       COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
             C            DATA SET D2334ACCEL AT LEVEL 005 AS OF 06/25/79
  ISN 0002          SUBROUTINE ACCELT(MASDEX,X1,YC,ZC,A1,A2,A3,TIME,NPTSP,NPTS)          00000010
             C                                                                          00000020
             C      REVISED 10-13-77                                                    00000030
             C                                                                          00000040
  ISN 0003          IMPLICIT REAL*8 (A-H,O-Z)                                           00000050
  ISN 0004          COMMON/INAC/   ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT      00000060
  ISN 0005          COMMON/INDEAC/ NACC                                                 00000070
  ISN 0006          ISAV = 1                                                            00000080
  ISN 0007          TT = TIME                                                           00000090
  ISN 0008     6105 DO 6100 I=ISAV,NACC                                                 00000100
  ISN 0009          I1 = I                                                              00000110
  ISN 0010     6200 FORMAT(2I5)                                                         00000120
  ISN 0011          IF(INDEX(I,1).EQ.MASDEX) GO TO 6101                                 00000130
  ISN 0013     6100 CONTINUE                                                            00000140
  ISN 0014          RETURN                                                              00000150
  ISN 0015     6101 ISAV = I1 + 1                                                       00000160
  ISN 0016          JSTRT = JAY(I1,1)                                                   00000170
  ISN 0017          NPTS = JAY(I1,2)                                                    00000180
  ISN 0018          NPTS=NPTSP+NPTS                                                     00000190
  ISN 0019          JSTOP=NPTS                                                          00000200
  ISN 0020          K=NPTSP+1                                                           00000210
  ISN 0021     6102 K = K+1                                                             00000220
  ISN 0022     6201 FORMAT(5I5)                                                         00000230
  ISN 0023          IF(TT.GE.TIM(K-1).AND.TT.LT.TIM(K)) GO TO 6103                      00000240
  ISN 0025          IF(K.NE.JSTOP) GO TO 6102                                           00000250
  ISN 0027          IREF=K                                                              00000260
  ISN 0028          NPTSP=NPTS                                                          00000270
  ISN 0029          GO TO 6104                                                          00000280
  ISN 0030     6103 IREF = K-1                                                          00000290
  ISN 0031          NPTSP=NPTS                                                          00000300
  ISN 0032     6104 CALL INTERP(IREF,TT,ACOUT)                                          00000310
  ISN 0033          IDER = INDEX(I,2)                                                   00000320
  ISN 0034          GO TO (6111,6112,6113,6114,6115,6116),IDER                          00000330
  ISN 0035          PRINT 6106,IDER                                                     00000340
  ISN 0036     6106 FORMAT(1X,'1. IDER OUT OF RANGE,VALUE = ',I2)                       00000350
  ISN 0037          RETURN                                                              00000360
  ISN 0038     6111 X1 = ACOUT                                                          00000370
  ISN 0039          GO TO 6107                                                          00000380
  ISN 0040     6112 YC = ACOUT                                                          00000390
  ISN 0041          GO TO 6107                                                          00000400
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ISN 0042      6113 ZC = ACOUT                                    00000410
ISN 0043           GO TO 6107                                    00000420
ISN 0044      6114 A1 = ACOUT                                    00000430
ISN 0045           GO TO 6107                                    00000440
ISN 0046      6115 A2 = ACOUT                                    00000450
ISN 0047           GO TO 6107                                    00000460
ISN 0048      6116 A3 = ACOUT                                    00000470
ISN 0049      6107 IF(ISAV.GT.NACC) RETURN                       00000480
ISN 0051           GO TO 6105                                    00000490
ISN 0052           END                                           00000500
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*              LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                      *
*                                                                                                *
**************************************************************************************************

      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
             C        DATA SET D2334CFORC AT LEVEL 004 AS OF 06/25/79
             C        DATA SET D2332VCF   AT LEVEL 001 AS OF 01/27/78            00000010
             C        DATA SET D2332VCFOR AT LEVEL 001 AS OF 09/06/77            00000020
             C        DATA SET D2332FCF   AT LEVEL 009 AS OF 09/02/77            00000030
 ISN 0002          SUBROUTINE CFORCE                                             00000040
             C                                                                   00000050
 ISN 0003          IMPLICIT REAL*8 (A-H,O-Z)                                     00000060
 ISN 0004          REAL*8 KUN                                                    00000070
 ISN 0005          INTEGER*4 TITLE(40)                                           00000080
 ISN 0006          INTEGER*2 N1,NN,IBS,JBS                                       00000090
 ISN 0007          INTEGER*2 MTEMP(40)                                           00000100
 ISN 0008          INTEGER*2 IJPR,IG,JG                                          00000110
 ISN 0009          INTEGER*2 II(40),KK(40),MM(40),INP(50),MNP(50),MG(150),NG(150) 00000120
 ISN 0010          DIMENSION VA(3),VADOT(3),PBAR(3),XLNGTH(3),IISP(3),XXLBAR(3), 00000130
                  1 FSP(3,3),XVOC(3,3),C4(3),C5(3),S(3),SDOT(3),PL(3,3)          00000140
 ISN 0011          DIMENSION DPQRIN(4),DXYZ(3),DXYZPR(3),TERM(6)                 00000150
 ISN 0012          DIMENSION XVOCSL(3,3),DVC3(3)                                 00000160
 ISN 0013          DIMENSION FSPB(3,3),FSPF(3,3),XVOCB(3,3),XVOCF(3,3),TERMF(6)  00000170
 ISN 0014          DIMENSION DVC(3),DVC1(3),DVCDOT(3),C4SL(3),C5SL(3),VCINT(3),  00000180
                  1 VEEDT(3),VEEC3(3),VEECS3(3)                                  00000190
 ISN 0015          DIMENSION TT(3),XXC(6),RTERM(6),RTERMF(6)                     00000200
 ISN 0016          DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)  00000210
 ISN 0017          DIMENSION LSTEST(3)                                           00000220
 ISN 0018          DIMENSION ETERM(3),ETB(3),ETF(3)                              00000230
 ISN 0019          COMMON/CFIC/ SINBET,COSBET,ABETA(9)                           00000240
 ISN 0020          COMMON/CFIR/ SIFL(40),SAFL(40),SBFL(40),SFFL(40),XKEFL(40)    00000250
 ISN 0021          COMMON/CFPR/ FSPRNG(40,8),DELG(40)                            00000260
 ISN 0022          COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),     00000270
                  1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT       00000280
 ISN 0023          COMMON/INPR/ NDRI,NSP                                         00000290
 ISN 0024          COMMON/INCFIC/ BETA                                           00000300
 ISN 0025          COMMON/INIDCP/ YDP(80)                                        00000310
 ISN 0026          COMMON/MACF/IBS(40),FSPOP(40), SCP(40), JBS(40),              00000320
                  1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),      00000330
                  2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT                       00000340
 ISN 0027          COMMON/MACFIN/ TMAX,IPRINT                                    00000350
 ISN 0028          COMMON/MCFIII/ SYMFLG                                         00000360
 ISN 0029          COMMON/NP00I2/ MG,NG,INP,MNP                                  00000370
 ISN 0030          COMMON/NP01I2/ II,KK,MM                                       00000380
 ISN 0031          COMMON/NP00I4/ NNP                                            00000390
 ISN 0032          COMMON/NP00R8/ RX,RY,RZ                                       00000400
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ISN 0033        COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
ISN 0034        COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
               1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
               2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
               3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
               4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
               5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
               6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
               7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
               8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
               9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
               A CEIKF(40),
               B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
               C NM,NB,I,J,IG(150),JG(150),
               D N1(900),NN(40),IJPR(150)
ISN 0035        EQUIVALENCE (C4(1),DXYZ(1)),(C5(1),DXYZPR(1))
ISN 0036        SIGN(X1,X2) = DSIGN(X1,X2)
ISN 0037        SQRT(X) = DSQRT(X)
ISN 0038        AMAX1(X,Y) = DMAX1(X,Y)
ISN 0039        ABS(X) = DABS(X)
ISN 0040        ONE = 1.
ISN 0041        VA(1) = X(I)
ISN 0042        VA(2) = Y(I)
ISN 0043        VA(3) = Z(I)
ISN 0044        VADOT(1) = XDOT(I)
ISN 0045        VADOT(2) = YDOT(I)
ISN 0046        VADOT(3) = ZDOT(I)
ISN 0047        PBAR(1) = P(I)
ISN 0048        PBAR(2) = Q(I)
ISN 0049        PBAR(3) = R(I)
          C
          C     DETERMINE WHAT NODE POINTS M MUST BE ANALYZED FOR THIS
          C     MASS POINT I.
          C
ISN 0050        KOUNT = 0
ISN 0051        DO 10 IKM=1,NSP
          C
          C ZERO GROUND DEFL. AT TIME = 0.
          C
ISN 0052        IF(TIME.NE.0.) GO TO 25
ISN 0054        DELG(IKM) = 0.
ISN 0055     25 IF(I.NE.II(IKM)) GO TO 10
ISN 0057        IF(KOUNT.NE.0) GO TO 11
ISN 0059        KOUNT = 1
ISN 0060        MTEMP(KOUNT) = MM(IKM)
ISN 0061        GO TO 10
ISN 0062     11 DO 13 JJ=1,KOUNT
ISN 0063        IF(MTEMP(JJ).EQ.MM(IKM)) GO TO 10
ISN 0065     13 CONTINUE
ISN 0066        KOUNT = KOUNT+1
ISN 0067        MTEMP(KOUNT) = MM(IKM)
ISN 0068     10 CONTINUE
          C
```

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              C     NOW DO ALL CFORCE CALCULATIONS INSIDE AN M LOOP FROM 1              00000940
              C     TO KOUNT.                                                           00000950
              C                                                                         00000960
ISN 0069            DO 20 IN=1,KOUNT                                                    00000970
ISN 0070            M = MTEMP(IN)                                                       00000980
              C                                                                         00000990
              C     DETERMINE WHICH K'S HAVE SPRINGS FOR CURRENT I AND M,               00001000
              C     AND SET IISP(K).                                                    00001010
              C                                                                         00001020
ISN 0071            DO 14 K=1,3                                                         00001030
ISN 0072            IISP(K) = 0                                                         00001040
ISN 0073            DO 16 IKM=1,NSP                                                     00001050
ISN 0074            IF(I.EQ.II(IKM).AND.M.EQ.MM(IKM).AND.K.EQ.KK(IKM)) IISP(K)=1        00001060
ISN 0076         16 CONTINUE                                                            00001070
ISN 0077         14 CONTINUE                                                            00001080
              C                                                                         00001090
              C     DETERMINE COMPONENTS OF RADIUS VECTOR FROM MASS POINT               00001100
              C     TO NODE POINT.                                                      00001110
              C                                                                         00001120
ISN 0078            IF(M.NE.0) GO TO 18                                                 00001130
ISN 0080            RRX = 0.                                                            00001140
ISN 0081            RRY = 0.                                                            00001150
ISN 0082            RRZ = 0.                                                            00001160
ISN 0083            GO TO 19                                                            00001170
ISN 0084         18 DO 17 JJ=1,NNP                                                      00001180
ISN 0085            IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 15                          00001190
ISN 0087         17 CONTINUE                                                            00001200
ISN 0088            PRINT 9,I,M                                                         00001210
ISN 0089          9 FORMAT(1X,'2. NO SUCH NODE POINT I,M',2I5)                          00001220
ISN 0090            STOP                                                                00001230
ISN 0091         15 RRX = RX(JJ)                                                        00001240
ISN 0092            RRY = RY(JJ)                                                        00001250
ISN 0093            RRZ = RZ(JJ)                                                        00001260
ISN 0094         19 CONTINUE                                                            00001270
              C INITIALIZE SOME MORE                                                    00001280
ISN 0095            DO 910 K = 1,3                                                      00001290
ISN 0096            DO 22 IKM=1,NSP                                                     00001300
ISN 0097            IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 24         00001310
ISN 0099         22 CONTINUE                                                            00001320
ISN 0100         24 XLNGTH(K) = XLBAR(IKM)                                              00001330
ISN 0101            XXLBAR(K) = XLBAR(IKM)                                              00001340
ISN 0102            VCINT(K) = 0.                                                       00001350
ISN 0103            SDOT(K) = 0.                                                        00001360
ISN 0104            DO 915 JJ = 1,3                                                     00001370
ISN 0105            FSP(JJ,K) = 0.0                                                     00001380
ISN 0106            FSPB(JJ,K) = 0.                                                     00001390
ISN 0107            FSPF(JJ,K) = 0.                                                     00001400
ISN 0108            XVOCSL(JJ,K) = 0.                                                   00001410
ISN 0109            XVOCB(JJ,K) = 0.                                                    00001420
ISN 0110            XVOCF(JJ,K) = 0.                                                    00001430
ISN 0111        915 XVOC(JJ,K) = 0.0                                                    00001440
ISN 0112            DO 911 K2=1,7                                                       00001450
ISN 0113            FSPRNG(IKM,K2) = 0.                                                 00001460
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ISN 0114        911 CONTINUE                                                          00001470
ISN 0115        910 CONTINUE                                                          00001480
              C LOOP G                                                                00001490
              C   CALCULATE VC3, C4, C5 IN GROUND AND SLOPE AXES                      00001500
ISN 0116            DVR1 = AI(1)*RRX+AI(4)*RRY+AI(7)*RRZ                              00001510
ISN 0117            DVR3 = AI(3)*RRX+AI(6)*RRY+AI(9)*RRZ                              00001520
ISN 0118            DVRD1 = AIDOT(1)*RRX+AIDOT(4)*RRY+AIDOT(7)*RRZ                    00001530
ISN 0119            DVRD3 = AIDOT(3)*RRX+AIDOT(6)*RRY+AIDOT(9)*RRZ                    00001540
ISN 0120            DO 920 K = 1,3                                                    00001550
ISN 0121            IF (IISP(K)) 925,920,925                                          00001560
ISN 0122        925 ISUB1 = 3*K-2                                                     00001570
ISN 0123            DVC1(K) = AI(ISUB1) * XXLBAR(K)                                   00001580
ISN 0124            ISUB3 = 3*K                                                       00001590
ISN 0125            DVC3(K) = AI(ISUB3) * XXLBAR(K)                                   00001600
ISN 0126            DVCSL3 = SINBET * DVC1(K) + COSBET * DVC3(K)                      00001610
ISN 0127            VC1 = VA(1) + DVC1(K)+DVR1                                        00001620
ISN 0128            VC3 = VA(3) + DVC3(K)+DVR3                                        00001630
ISN 0129            VCSL3 = SINBET * VC1 + COSBET * VC3                               00001640
ISN 0130            DVCD1 = AIDOT(ISUB1) * XXLBAR(K)                                  00001650
ISN 0131            DVCD3 = AIDOT(ISUB3) * XXLBAR(K)                                  00001660
ISN 0132            DVCSD3 = SINBET * DVCD1 + COSBET * DVCD3                          00001670
ISN 0133            VCD1 = VADOT(1) + DVCD1+DVRD1                                     00001680
ISN 0134            VCD3 = VADOT(3) + DVCD3+DVRD3                                     00001690
ISN 0135            VCSD3 = SINBET * VCD1 + COSBET * VCD3                             00001700
ISN 0136            VEEC3(K) = VC3                                                    00001710
ISN 0137            VEECS3(K) = VCSL3                                                 00001720
ISN 0138            IF (DVC3(K)) 927,926,927                                          00001730
ISN 0139        926 C4(K) = 0.                                                        00001740
ISN 0140            C5(K) = 0.                                                        00001750
ISN 0141            GO TO 928                                                         00001760
ISN 0142        927 C4(K) = VC3/DVC3(K)                                               00001770
ISN 0143            C5(K) = (DVC3(K) * VCD3 - VC3 * DVCD3)/(DVC3(K) * DVC3(K))        00001780
ISN 0144        928 IF (DVCSL3) 930,929,930                                           00001790
ISN 0145        929 C4SL(K) = 0.                                                      00001800
ISN 0146            C5SL(K) = 0.                                                      00001810
ISN 0147            GO TO 920                                                         00001820
ISN 0148        930 C4SL(K) = VCSL3/DVCSL3                                            00001830
ISN 0149            C5SL(K) = (DVCSL3 * VCSD3 - VCSL3 * DVCSD3)/(DVCSL3 * DVCSL3)     00001840
ISN 0150        920 CONTINUE                                                          00001850
              C LOOP H                                                                00001860
              C   CALCULATE X COORD OF SPRING INTERSECTION PT TO SEE IF LEVEL OR      00001870
              C        SLOPE IS USED.                                                 00001880
ISN 0151            DO 30 K = 1,3                                                     00001890
ISN 0152            IF (IISP(K)) 35,30,35                                             00001900
ISN 0153         35 IF (VEEC3(K)) 36,36,40                                            00001910
ISN 0154         36 IF (VEECS3(K)) 30,30,40                                           00001920
ISN 0155         40 VCINT(K) = VA(1) + DVC1(K) * (1-C4(K))+DVR1                       00001930
ISN 0156            IF(DVC3(K).LE.0.) VCINT(K) = 1000.D0                              00001940
              C     THIS TAKES CARE OF HORIZONTAL AND UPWARD POINTING SPRINGS         00001950
ISN 0158            ISUB = 3*(K-1)                                                    00001960
ISN 0159            BARL = XXLBAR(K)                                                  00001970
ISN 0160            SUM = 0.0                                                         00001980
ISN 0161            SUMD = 0.0                                                        00001990
```

```
         C  LOOP J1  CALCULATE ALL DVC & DVCDOT IN GROUND SYSTEM
ISN 0162         DO 50 J=1,3
ISN 0163         ISUB = ISUB + 1
ISN 0164         DVC(J) = AI(ISUB) * BARL
ISN 0165         DVCDOT(J) = AIDOT(ISUB) * BARL
ISN 0166      50 CONTINUE
         C  LOOP J2  CALCULATE DVC & DVCDOT IN SLOPE AXES IF APPROPRIATE. FORM
         C        SUM & SUMD FOR SK & SKDOT.
ISN 0167         DO 52 J=1,3
ISN 0168         IF (BETA) 54,56,54
ISN 0169      54 IF (VCINT(K)) 56,56,58
ISN 0170      58 SUM1 = 0.
ISN 0171         SUM2 = 0.
ISN 0172         JSUB = 3*(J-1)
ISN 0173         DO 53 L=1,3
ISN 0174         JSUB = JSUB + 1
ISN 0175         SUM1 = SUM1 + ABETA(JSUB) * DVC(L)
ISN 0176         SUM2 = SUM2 + ABETA(JSUB) * DVCDOT(L)
ISN 0177      53 CONTINUE
ISN 0178         DVEEC = SUM1
ISN 0179         DVEECD = SUM2
ISN 0180         C4BAR = C4SL(K)
ISN 0181         C5BAR = C5SL(K)
ISN 0182         LSTEST(K) = 1.
ISN 0183         GO TO 59
ISN 0184      56 DVEEC = DVC(J)
ISN 0185         DVEECD = DVCDOT(J)
ISN 0186         C4BAR = C4(K)
ISN 0187         C5BAR = C5(K)
ISN 0188         LSTEST(K) = 0
ISN 0189      59 DVP = C4BAR * DVEEC
ISN 0190         DDP = C4BAR * DVEECD + C5BAR * DVEEC
ISN 0191         SUM = SUM + DVP * DVP
ISN 0192         SUMD = SUMD + DVP * DDP
ISN 0193      52 CONTINUE
ISN 0194         SK = SQRT(SUM)
ISN 0195         S(K) = SK
ISN 0196         SDOT(K) = SUMD/SK
         C GET LENGTH
ISN 0197         DO 822 IKM=1,NSP
ISN 0198         IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 824
ISN 0200     822 CONTINUE
ISN 0201     824 SC(IKM) = SK
ISN 0202         IF(BARL) 55,60,60
ISN 0203      55 T = -BARL-SK+DELG(IKM)
ISN 0204         T = -T
ISN 0205         GO TO 65
ISN 0206      60 T = BARL-SK+DELG(IKM)
ISN 0207      65 XLNGTH(K) = T
ISN 0208      30 CONTINUE
ISN 0209         PL(1,1) = -SDOT(1)*SIGN(ONE,XXLBAR(1))
ISN 0210         PL(2,2) = -SDOT(2)*SIGN(ONE,XXLBAR(2))
ISN 0211         PL(3,3) = -SDOT(3)*SIGN(ONE,XXLBAR(3))
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ISN 0212          PL(1,1) = 0.                                           00002530
ISN 0213          PL(2,2) = 0.                                           00002540
ISN 0214          PL(3,3) = 0.                                           00002550
ISN 0215          PL(2,1) = PBAR(3)*XLNGTH(1)                            00002560
ISN 0216          PL(3,1) = -PBAR(2)*XLNGTH(1)                           00002570
ISN 0217          PL(1,2) = -PBAR(3)*XLNGTH(2)                           00002580
ISN 0218          PL(3,2) = PBAR(1)*XLNGTH(2)                            00002590
ISN 0219          PL(1,3) = PBAR(2)*XLNGTH(3)                            00002600
ISN 0220          PL(2,3) = -PBAR(1)*XLNGTH(3)                           00002610
ISN 0221          IF(M.EQ.0) GO TO 76                                    00002620
ISN 0223          TT(1) = -PBAR(3)*RRY+PBAR(2)*RRZ                       00002630
ISN 0224          TT(2) =  PBAR(3)*RRX-PBAR(1)*RRZ                       00002640
ISN 0225          TT(3) = -PBAR(2)*RRX+PBAR(1)*RRY                       00002650
ISN 0226          DO 77 K=1,3                                            00002660
ISN 0227          DO 78 JJ=1,3                                           00002670
ISN 0228          PL(JJ,K) = PL(JJ,K)+TT(JJ)                             00002680
ISN 0229       78 CONTINUE                                               00002690
ISN 0230       77 CONTINUE                                               00002700
            C LOOP K                                                     00002710
ISN 0231       76 DO 75 JJ = 1,3                                         00002720
ISN 0232          ISUB = JJ-3                                            00002730
ISN 0233          VAD = VADOT(JJ)                                        00002740
            C LOOP L                                                     00002750
ISN 0234          DO 80 K = 1,3                                          00002760
ISN 0235          IF(IISP(K)) 85,80,85                                   00002770
ISN 0236       85 IF(VEEC3(K)) 81,81,90                                  00002780
ISN 0237       81 IF(VEECS3(K)) 80,80,90                                 00002790
ISN 0238       90 SUM = 0.0                                              00002800
            C LOOP M                                                     00002810
ISN 0239          DO 95 L = 1,3                                          00002820
ISN 0240          ISUB = ISUB+3                                          00002830
ISN 0241       95 SUM = SUM+AI(ISUB)*PL(L,K)                             00002840
ISN 0242          VEEDOT(JJ,K) = VAD+SUM                                 00002850
ISN 0243       80 CONTINUE                                               00002860
ISN 0244       75 CONTINUE                                               00002870
            C  CALCULATE CONTACT POINT VELOCITIES ON SLOPE.              00002880
ISN 0245          IF (BETA) 98,96,98                                     00002890
ISN 0246       98 DO 101 K=1,3                                           00002900
ISN 0247          IF (VCINT(K)) 101,101,94                               00002910
ISN 0248       94 DO 97 J=1,3                                            00002920
ISN 0249          SUM = 0.                                               00002930
ISN 0250          JSUB = 3*(J-1)                                         00002940
ISN 0251          DO 99 L=1,3                                            00002950
ISN 0252          JSUB = JSUB + 1                                        00002960
ISN 0253          SUM = SUM + ABETA(JSUB) * VEEDOT(L,K)                  00002970
ISN 0254       99 CONTINUE                                               00002980
ISN 0255          VEEDT(J) = SUM                                         00002990
ISN 0256       97 CONTINUE                                               00003000
ISN 0257          DO 102 JJ=1,3                                          00003010
ISN 0258          VEEDOT(JJ,K) = VEEDT(JJ)                               00003020
ISN 0259      102 CONTINUE                                               00003030
ISN 0260      101 CONTINUE                                               00003040
            C LOOP N                                                     00003050
```

```
ISN 0261      96 DO 105 K = 1,3
ISN 0262         IF(IISP(K)) 110,105,110
ISN 0263     110 IF(VEEC3(K)) 111,111,115
ISN 0264     111 IF(VEECS3(K)) 105,105,115
ISN 0265     115 SK = S(K)
            C
            C    GET SPRING NUMBER TO USE INPUT DATA SUBSCRIPTED BY IKM.
            C
ISN 0266         DO 1002 IKM=1,NSP
ISN 0267         IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 1003
ISN 0269    1002 CONTINUE
ISN 0270    1003 SC(IKM) = SK
            C
            C CALCULATION OF FSPO.
            C
ISN 0271         IF(SDOT(K).LT.0.) GO TO 140
ISN 0273         IF(SK.LT.SBAR(IKM)) GO TO 140
            C
            C LOADING PATH.
            C
ISN 0275         IF(IBS(IKM).NE.0) GO TO 125
ISN 0277         IF(SK.GT.SFFL(IKM)) GO TO 130
            C
            C NORMAL FSPO CALCULATIONS FOR LOADING CASE.
            C
ISN 0279         FSPO = FSPOF(IKM)
ISN 0280         IF(SK.GE.SBFL(IKM)) GO TO 150
ISN 0282         IF(SK.GE.SAFL(IKM)) GO TO 148
ISN 0284         FSPO = FSPOI(IKM)
ISN 0285         IF(SK.GE.SIFL(IKM)) GO TO 150
ISN 0287         FSPO = FSPO*SK/SIFL(IKM)
ISN 0288         GO TO 150
ISN 0289     148 FSPO = FSPOI(IKM)+(SK-SAFL(IKM))*(FSPO-FSPOI(IKM))/
                1 (SBFL(IKM)-SAFL(IKM))
ISN 0290         GO TO 150
            C
            C FSPO CALCULATIONS ON BOTTOMING SPRING.
            C
ISN 0291     130 IBS(IKM) = 1
ISN 0292     125 FSPO = FSPOF(IKM)+XKEFL(IKM)*(SK-SFFL(IKM))
ISN 0293     150 FSPBAR(IKM) = FSPO
ISN 0294         SBAR(IKM) = SK
ISN 0295         NN(IKM) = 0
ISN 0296         GO TO 155
            C
            C UNLOADING AND RELOADING PATHS.
            C
ISN 0297     140 IF(NN(IKM).NE.0) GO TO 135
ISN 0299         IF(IBS(IKM).EQ.0) GO TO 145
            C
            C UNLOADING AND RELOADING ON BOTTOMING SPRING.
            C
ISN 0301         KUN(IKM) = XKE(IKM)
```

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ISN 0302          GO TO 146                                                     00003590
            C                                                                   00003600
            C  NORMAL UNLOADING AND RELOADING.                                  00003610
            C                                                                   00003620
ISN 0303      145 IF(SK.LE.SAFL(IKM)) GO TO 147                                 00003630
ISN 0305          KUN(IKM) = (FSPOF(IKM)-FSPOI(IKM))/(SB(IKM)-SA(IKM))          00003640
ISN 0306          IF(KUN(IKM).LT.(FSPBAR(IKM)/SBAR(IKM))) GO TO 147            00003650
ISN 0308          GO TO 146                                                     00003660
ISN 0309      147 KUN(IKM) = FSPOI(IKM)/SI(IKM)                                 00003670
ISN 0310      146 NN(IKM) = 1                                                   00003680
ISN 0311      135 FSPO = FSPBAR(IKM)-(SBAR(IKM)-SK)*KUN(IKM)                    00003690
ISN 0312      155 FSPD=CDAMP(IKM)*SDOT(K)                                       00003700
ISN 0313          IF(SDOT(K).LT. 0) FSPD=0.                                     00003710
ISN 0315          FSPO=FSPO+FSPD                                                00003720
            C     NOW IF FSPO IS NEGATIVE,SET IT EQUAL TO ZERO                  00003730
ISN 0316          IF(FSPO.LT.0.) FSPO=0.                                        00003740
ISN 0318          FSPOF5=10.*AMAX1(FSPOF(IKM),FSPOI(IKM))                       00003750
            C      CUTOFF FORCE=10*MAX OF FSPOF,FSPOI                           00003760
ISN 0319          IF(FSPO.GT.FSPOF5) FSPO=FSPOF5                                00003770
ISN 0321          IF(SDOT(K).LT.0.) GO TO 1020                                  00003780
            C       JBS=1 INITIAL LOADING OCCURS                                00003790
            C       JBS=2 MAX.LOAD AND/OR DEFLECTION OCCUR                      00003800
            C       JBS=3 UNLOAD TO ZERO FORCE                                  00003810
            C       JBS=4 RELOAD OCCURS                                         00003820
            C       JBS=5 MAX.LOAD DUE TO DAMPING OCCURS                        00003830
ISN 0323          IF(JBS(IKM).EQ.5) GO TO 1040                                  00003840
            C       INITIAL LOADING SUMMARY                                     00003850
ISN 0325          IF(JBS(IKM).EQ.2) GO TO 1030                                  00003860
ISN 0327          IF(SCP(IKM).GT.0.0 .AND.FSPD.NE.0.) GO TO 1012               00003870
ISN 0329          IF(SCP(IKM).GT.0.) GO TO 1030                                 00003880
ISN 0331          IF(SC(IKM).LE.0.) GO TO 1030                                  00003890
ISN 0333          IF (JBS(IKM).GT.0) GO TO 1009                                 00003900
ISN 0335          KKONT=KKONT+1                                                 00003910
ISN 0336          TSP(KKONT)=TIME                                               00003920
ISN 0337          EXSP(1,KKONT)=SK                                              00003930
ISN 0338          STEMP1(IKM)=SK                                                00003940
ISN 0339          KKSP(1,KKONT)=II(IKM)                                         00003950
ISN 0340          KKSP(2,KKONT)=MM(IKM)                                         00003960
ISN 0341          KKSP(3,KKONT)=KK(IKM)                                         00003970
ISN 0342          KKSP(4,KKONT)=1                                               00003980
ISN 0343     1009 IF(JBS(IKM).GT.3) GO TO 1008                                  00003990
ISN 0345          JBS(IKM)=1                                                    00004000
ISN 0346          GO TO 1040                                                    00004010
ISN 0347     1008 IF(FSPO.GT.0.0 .AND.SK.GT.SCP(IKM)) GO TO 1031               00004020
ISN 0349          GO TO 1040                                                    00004030
            C      MAXIMUM LOADING SUMMARY                                      00004040
ISN 0350     1012 IF(JBS(IKM).EQ.3) GO TO 1030                                  00004050
ISN 0352          IF(FSPOP(IKM).LT.FSPO) GO TO 1040                             00004060
ISN 0354          IF(JBS(IKM).EQ.4) JBS(IKM)=5                                  00004070
ISN 0356          IF(JBS(IKM).EQ.1) JBS(IKM)=5                                  00004080
ISN 0358     1010 IF(JBS(IKM).EQ.2) GO TO 1040                                  00004090
ISN 0360          KKONT=KKONT+1                                                 00004100
ISN 0361          TSP(KKONT)=TIME                                               00004110
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ISN 0362            EXSP(1,KKONT)=STEMP1(IKM)                                       00004120
ISN 0363            EXSP(2,KKONT)=FSPOP(IKM)                                        00004130
ISN 0364            EXSP(3,KKONT)=SCP(IKM)                                          00004140
ISN 0365            EXSP(4,KKONT)=STEMP3(IKM)                                       00004150
ISN 0366            EXSP(5,KKONT)=STEMP2(IKM)                                       00004160
ISN 0367            STEMP4(IKM)=FSPOP(IKM)                                          00004170
ISN 0368            STEMP5(IKM)=SCP(IKM)                                            00004180
ISN 0369            KKSP(1,KKONT)=II(IKM)                                           00004190
ISN 0370            KKSP(2,KKONT)=MM(IKM)                                           00004200
ISN 0371            KKSP(3,KKONT)=KK(IKM)                                           00004210
ISN 0372            KKSP(4,KKONT)=2                                                 00004220
ISN 0373            IF(FSPO.EQ.0.) GO TO 1013                                       00004230
ISN 0375            IF(JBS(IKM).NE.5) GO TO 1013                                    00004240
ISN 0377            GO TO 1040                                                      00004250
ISN 0378       1013 JBS(IKM)=2                                                      00004260
ISN 0379            GO TO 1040                                                      00004270
              C       UNLOADING SUMMARY                                             00004280
ISN 0380       1020 IF(FSPOP(IKM).GT.FSPO .AND.FSPO.NE.0.0 .AND.SK.LT.SCP(IKM))     00004290
                   1 GO TO 1010                                                     00004300
ISN 0382            IF(FSPO.NE.0.) GO  TO 1040                                      00004310
ISN 0384            IF(FSPOP(IKM).LT.FSPO) GO TO 1040                               00004320
ISN 0386            IF(JBS(IKM).EQ.3) GO TO 1040                                    00004330
ISN 0388            KKONT=KKONT+1                                                   00004340
ISN 0389            TSP(KKONT)=TIME                                                 00004350
ISN 0390            EXSP(1,KKONT)=STEMP1(IKM)                                       00004360
ISN 0391            EXSP(2,KKONT)=STEMP4(IKM)                                       00004370
ISN 0392            EXSP(3,KKONT)=STEMP5(IKM)                                       00004380
ISN 0393            EXSP(4,KKONT)=SK                                                00004390
ISN 0394            EXSP(5,KKONT)=FSPO                                              00004400
ISN 0395            STEMP2(IKM)=FSPO                                                00004410
ISN 0396            STEMP3(IKM)=SK                                                  00004420
ISN 0397            KKSP(1,KKONT)=II(IKM)                                           00004430
ISN 0398            KKSP(2,KKONT)=MM(IKM)                                           00004440
ISN 0399            KKSP(3,KKONT)=KK(IKM)                                           00004450
ISN 0400            KKSP(4,KKONT)=3                                                 00004460
ISN 0401            JBS(IKM)=3                                                      00004470
ISN 0402            GO TO 1040                                                      00004480
              C       RELOADING SUMMARY                                             00004490
ISN 0403       1030 IF(JBS(IKM).EQ.2 .AND.FSPOP(IKM).NE.0.0 .AND. FSPO.GT.FSPOP(IKM)) 00004500
                   1 GO TO 1031                                                     00004510
ISN 0405            IF(JBS(IKM).EQ.1) GO TO 1040                                    00004520
ISN 0407            IF(JBS(IKM).EQ.4) GO TO 1040                                    00004530
ISN 0409            IF(SK.LT.STEMP3(IKM)) GO TO 1040                                00004540
ISN 0411            IF(FSPOP(IKM).NE.0.0 .AND. FSPO.LE.FSPOP(IKM)) GO TO 1040       00004550
ISN 0413       1031 KKONT=KKONT+1                                                   00004560
ISN 0414            TSP(KKONT)=TIME                                                 00004570
ISN 0415            EXSP(1,KKONT)=SK                                                00004580
ISN 0416            EXSP(2,KKONT)=STEMP4(IKM)                                       00004590
ISN 0417            EXSP(3,KKONT)=STEMP5(IKM)                                       00004600
ISN 0418            IF(JBS(IKM).EQ.2) GO TO 1032                                    00004610
ISN 0420            EXSP(4,KKONT)=STEMP3(IKM)                                       00004620
ISN 0421            EXSP(5,KKONT)=STEMP2(IKM)                                       00004630
ISN 0422            GO TO 1033                                                      00004640
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ISN 0423    1032 EXSP(4,KKONT)=SK                                            00004650
ISN 0424         EXSP(5,KKONT)=FSPO                                          00004660
ISN 0425         STEMP2(IKM)=FSPO                                            00004670
ISN 0426         STEMP3(IKM)=SK                                              00004680
ISN 0427    1033 STEMP1(IKM)=SK                                              00004690
ISN 0428         KKSP(1,KKONT)=II(IKM)                                       00004700
ISN 0429         KKSP(2,KKONT)=MM(IKM)                                       00004710
ISN 0430         KKSP(3,KKONT)=KK(IKM)                                       00004720
ISN 0431         KKSP(4,KKONT)=4                                             00004730
ISN 0432         JBS(IKM)=4                                                  00004740
ISN 0433    1040 SCP(IKM)=SK                                                 00004750
ISN 0434         FSPOP(IKM)=FSPO                                             00004760
ISN 0435         OLDELG = DELG(IKM)                                          00004770
ISN 0436         DELG(IKM) = FSPO*GFLEX(IKM)                                 00004780
ISN 0437         DELG(IKM) = AMAX1(OLDELG,DELG(IKM))                         00004790
ISN 0438         FSPRNG(IKM,1) = FSPO                                        00004800
ISN 0439         FSPRNG(IKM,8)=FSPD                                          00004810
           C     CALCULATE FPLOW(TIME)                                       00004820
ISN 0440         FPLOW = XMAX(IKM)                                           00004830
ISN 0441         IF(TIME.GE.PLOWT) FPLOW=0.                                  00004840
           C     CHECK TO SEE IF SPRING IS ON SLOPE OR BETA = 0.             00004850
ISN 0443         IF(VCINT(K)) 191,191,180                                    00004860
ISN 0444     180 IF(BETA.EQ.0.) GO TO 191                                    00004870
           C     GET 3 COMPONENTS OF FSPO IN GROUND AXES                     00004880
ISN 0446         XVOC(1,K) = AI(3*K-2)*FSPO                                  00004890
ISN 0447         XVOC(2,K) = AI(3*K-1)*FSPO                                  00004900
ISN 0448         XVOC(3,K) = AI(3*K)*FSPO                                    00004910
ISN 0449         XVOC(1,K) = XVOC(1,K)*SIGN(ONE,XXLBAR(K))                   00004920
ISN 0450         XVOC(2,K) = XVOC(2,K)*SIGN(ONE,XXLBAR(K))                   00004930
ISN 0451         XVOC(3,K) = XVOC(3,K)*SIGN(ONE,XXLBAR(K))                   00004940
           C     CONVERT TO SLOPE AXES,GETTING Z COMPONENT ONLY              00004950
ISN 0452         XVOCSL(3,K) = SINBET*XVOC(1,K)+COSBET*XVOC(3,K)             00004960
           C     CALCULATE X AND Y COMPONENTS IN SLOPE AXES FROM GROUND FRICTION 00004970
           C     AND VELOCITY DIRECTION                                      00004980
ISN 0453         V1 = VEEDOT(1,K)                                            00004990
ISN 0454         V2 = VEEDOT(2,K)                                            00005000
ISN 0455         VBB = SQRT(V1*V1+V2*V2)                                     00005010
ISN 0456         IF(VBB) 183,183,182                                         00005020
ISN 0457     183 VX=0.                                                       00005030
ISN 0458         GO TO 184                                                   00005040
ISN 0459     182 VX = XMU(IKM)*XVOCSL(3,K)/VBB+FPLOW/VBB                     00005050
ISN 0460     184 XVOCSL(1,K) = VX*VEEDOT(1,K)                                00005060
ISN 0461         XVOCSL(2,K) = VX*VEEDOT(2,K)                                00005070
ISN 0462         IF(SYMFLG.NE.0.AND.YDP(I).EQ.0.) XVOCSL(2,K) = 0.           00005080
ISN 0464         FSPRNG(IKM,2) = XVOCSL(1,K)                                 00005090
ISN 0465         FSPRNG(IKM,3) = XVOCSL(2,K)                                 00005100
ISN 0466         FSPRNG(IKM,4) = XVOCSL(3,K)                                 00005110
           C     NOW TRANSFORM BACK TO GROUND AXES TO REJOIN BASIC CODING    00005120
           C     FROM HERE ON SEPARATE LOADS NORMAL TO SURFACE AND FRICTION LOADS 00005130
           C     TO CALCULATE CRUSHING ENERGY AND FRICTION ENERGY            00005140
ISN 0467     181 XVOCB(1,K) = SINBET*XVOCSL(3,K)                             00005150
ISN 0468         XVOCB(2,K) = 0.                                             00005160
ISN 0469         XVOCB(3,K) = COSBET*XVOCSL(3,K)                             00005170
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ISN 0470          XVOCF(1,K) = COSBET*XVOCSL(1,K)                               00005180
ISN 0471          XVOCF(2,K) = XVCCSL(2,K)                                      00005190
ISN 0472          XVOCF(3,K) =-SINBET*XVOCSL(1,K)                               00005200
ISN 0473          GO TO 210                                                     00005210
            C (15A)                                                             00005220
ISN 0474      191 VX = AI(3*K)*FSPO                                             00005230
ISN 0475          VX = VX*SIGN(ONE,XXLBAR(K))                                   00005240
ISN 0476          XVOC(3,K) = VX                                                00005250
ISN 0477          V1 = VEEDOT(1,K)                                              00005260
ISN 0478          V2 = VEEDOT(2,K)                                              00005270
ISN 0479          VBB = SQRT(V1*V1+V2*V2)                                       00005280
ISN 0480          IF(VBB) 201,201,200                                           00005290
ISN 0481      201 VX=0.                                                         00005300
ISN 0482          GO TO 202                                                     00005310
ISN 0483      200 VX = XMU(IKM)*VX/VBB+FPLOW/VBB                                00005320
ISN 0484      202 XVOCB(1,K) = 0.                                               00005330
ISN 0485          XVOCB(2,K) = 0.                                               00005340
ISN 0486          XVOCB(3,K) = XVOC(3,K)                                        00005350
ISN 0487          XVOCF(3,K) = 0.                                               00005360
ISN 0488          XVOCF(1,K) = VX*VEEDOT(1,K)                                   00005370
ISN 0489          XVOCF(2,K) = VX*VEEDOT(2,K)                                   00005380
ISN 0490          IF(SYMFLG.NE.0.AND.YDP(I).EQ.0.) XVOCF(2,K) = 0.              00005390
ISN 0492          FSPRNG(IKM,2) = XVOCF(1,K)                                    00005400
ISN 0493          FSPRNG(IKM,3) = XVOCF(2,K)                                    00005410
ISN 0494          FSPRNG(IKM,4) = XVOCB(3,K)                                    00005420
ISN 0495      210 IF(BARL) 355,360,360                                          00005430
ISN 0496      355 T = -BARL-SK+DELG(IKM)                                        00005440
ISN 0497          T = -T                                                        00005450
ISN 0498          GO TO 365                                                     00005460
ISN 0499      360 T = BARL-SK+DELG(IKM)                                         00005470
ISN 0500      365 XLNGTH(K) = T                                                 00005480
ISN 0501          IS = 0                                                        00005490
            C LOOP Q                                                            00005500
ISN 0502          DO 220 J = 1,3                                                00005510
ISN 0503          SUMB = 0.                                                     00005520
ISN 0504          SUMF = 0.                                                     00005530
            C LOOP R                                                            00005540
ISN 0505          DO 230 L = 1,3                                                00005550
ISN 0506          IS = IS+1                                                     00005560
ISN 0507          SUMB = SUMB-AI(IS)*XVOCB(L,K)                                 00005570
ISN 0508      230 SUMF = SUMF-AI(IS)*XVOCF(L,K)                                 00005580
ISN 0509          FSPB(J,K) = SUMB                                              00005590
ISN 0510          FSPF(J,K) = SUMF                                              00005600
ISN 0511          FSP(J,K) = SUMB+SUMF                                          00005610
ISN 0512          FSPRNG(IKM,(J+4)) = FSP(J,K)                                  00005620
ISN 0513      220 CONTINUE                                                      00005630
            C END OF LOOP N                                                     00005640
ISN 0514      105 CONTINUE                                                      00005650
            C CRASH FORCES                                                      00005660
ISN 0515          DO 240 J = 1,3                                                00005670
ISN 0516          SUM = 0.0                                                     00005680
ISN 0517          DO 250 K = 1,3                                                00005690
ISN 0518      250 SUM = SUM+FSP(J,K)                                            00005700
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ISN 0519           XXC(J) = SUM
ISN 0520       240 CONTINUE
             C     DXYZ(1) = DX(I)
             C     DXYZ(2) = DY(I)
             C     DXYZ(3) = DZ(I)
ISN 0521           DXYZ(1) = VADOT(1)*DELTAT
ISN 0522           DXYZ(2) = VADOT(2)*DELTAT
ISN 0523           DXYZ(3) = VADOT(3)*DELTAT
             C     DPQRIN(1) = DQIN(I)
             C     DPQRIN(2) = DRIN(I)
             C     DPQRIN(3) = DPIN(I)
             C     DPQRIN(4) = DQIN(I)
ISN 0524           DPQRIN(1) = PBAR(2)*DELTAT
ISN 0525           DPQRIN(2) = PBAR(3)*DELTAT
ISN 0526           DPQRIN(3) = PBAR(1)*DELTAT
ISN 0527           DPQRIN(4) = PBAR(2)*DELTAT
ISN 0528           TERM(1) = FSPB(3,1)*(XLNGTH(1)+RRX)
ISN 0529           TERM(2) = FSPB(1,2)*(XLNGTH(2)+RRY)
ISN 0530           TERM(3) = FSPB(2,3)*(XLNGTH(3)+RRZ)
ISN 0531           TERM(4) = FSPB(2,1)*(XLNGTH(1)+RRX)
ISN 0532           TERM(5) = FSPB(3,2)*(XLNGTH(2)+RRY)
ISN 0533           TERM(6) = FSPB(1,3)*(XLNGTH(3)+RRZ)
ISN 0534           TERMF(1) = FSPF(3,1)*(XLNGTH(1)+RRX)
ISN 0535           TERMF(2) = FSPF(1,2)*(XLNGTH(2)+RRY)
ISN 0536           TERMF(3) = FSPF(2,3)*(XLNGTH(3)+RRZ)
ISN 0537           TERMF(4) = FSPF(2,1)*(XLNGTH(1)+RRX)
ISN 0538           TERMF(5) = FSPF(3,2)*(XLNGTH(2)+RRY)
ISN 0539           TERMF(6) = FSPF(1,3)*(XLNGTH(3)+RRZ)
             C CRASH MOMENTS
ISN 0540           XXC(4) = TERM(5)+TERMF(5)-TERM(3)-TERMF(3)
ISN 0541           XXC(5) = TERM(6)+TERMF(6)-TERM(1)-TERMF(1)
ISN 0542           XXC(6) = TERM(4)+TERMF(4)-TERM(2)-TERMF(2)
ISN 0543           IF(M.EQ.0) GO TO 2001
             C
             C     IF WE ARE AT A NODE POINT, WE MUST CALCULATE ADDITIONAL
             C     MOMENT CONTRIBUTIONS TO XXC(4-6).
             C
ISN 0545           RTERM(1) = RRX*(FSPB(3,2)+FSPB(3,3))
ISN 0546           RTERM(2) = RRY*(FSPB(1,1)+FSPB(1,3))
ISN 0547           RTERM(3) = RRZ*(FSPB(2,1)+FSPB(2,2))
ISN 0548           RTERM(4) = RRX*(FSPB(2,2)+FSPB(2,3))
ISN 0549           RTERM(5) = RRY*(FSPB(3,1)+FSPB(3,3))
ISN 0550           RTERM(6) = RRZ*(FSPB(1,1)+FSPB(1,2))
ISN 0551           RTERMF(1) = RRX*(FSPF(3,2)+FSPF(3,3))
ISN 0552           RTERMF(2) = RRY*(FSPF(1,1)+FSPF(1,3))
ISN 0553           RTERMF(3) = RRZ*(FSPF(2,1)+FSPF(2,2))
ISN 0554           RTERMF(4) = RRX*(FSPF(2,2)+FSPF(2,3))
ISN 0555           RTERMF(5) = RRY*(FSPF(3,1)+FSPF(3,3))
ISN 0556           RTERMF(6) = RRZ*(FSPF(1,1)+FSPF(1,2))
ISN 0557           XXC(4) = XXC(4)+RTERM(5)+RTERMF(5)-RTERM(3)-RTERMF(3)
ISN 0558           XXC(5) = XXC(5)+RTERM(6)+RTERMF(6)-RTERM(1)-RTERMF(1)
ISN 0559           XXC(6) = XXC(6)+RTERM(4)+RTERMF(4)-RTERM(2)-RTERMF(2)
ISN 0560           ETERM(1) = RRY*DPQRIN(2)-RRZ*DPQRIN(1)
```

```
ISN 0561          ETERM(2) = RRZ*DPQRIN(3)-RRX*DPQRIN(2)                        00006240
ISN 0562          ETERM(3) = RRX*DPQRIN(1)-RRY*DPQRIN(3)                        00006250
ISN 0563          ETB(1) = DPQRIN(3)*(RRY*FSPB(3,1)-RRZ*FSPB(2,1))              00006260
ISN 0564          ETB(2) = DPQRIN(1)*(RRZ*FSPB(1,2)-RRX*FSPB(3,2))              00006270
ISN 0565          ETB(3) = DPQRIN(2)*(RRX*FSPB(2,3)-RRY*FSPB(1,3))              00006280
ISN 0566          ETF(1) = DPQRIN(3)*(RRY*FSPF(3,1)-RRZ*FSPF(2,1))              00006290
ISN 0567          ETF(2) = DPQRIN(1)*(RRZ*FSPF(1,2)-RRX*FSPF(3,2))              00006300
ISN 0568          ETF(3) = DPQRIN(2)*(RRX*FSPF(2,3)-RRY*FSPF(1,3))              00006310
            C                                                                   00006320
            C     FOR SYMMETRICAL CASE,CENTERLINE MASSES,FORCE Y,L,N LOADS TO ZERO 00006330
            C                                                                   00006340
ISN 0569     2001 IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 2010                    00006350
ISN 0571          XXC(2) = 0.                                                   00006360
ISN 0572          XXC(4) = 0.                                                   00006370
ISN 0573          XXC(6) = 0.                                                   00006380
ISN 0574          IF(M.EQ.0.OR.SYMFLG.EQ.2.) GO TO 2010                         00006390
ISN 0576          DO 2002 JJ=1,NNP                                              00006400
ISN 0577          IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2004                  00006410
ISN 0579     2002 CONTINUE                                                      00006420
ISN 0580     2004 IF(YNPDP(JJ).EQ.0.) GO TO 2010                                00006430
            C                                                                   00006440
            C     IF WE HAVE A SYMMETRIC CASE,CL MASS,AND NON-CL NODE POINT,    00006450
            C     WE MUST DOUBLE X,Z AND M LOADS ON MASS I DUE TO THE EXTERNAL  00006460
            C     SPRING ON THE OPPOSITE SIDE NODE POINT.                       00006470
            C                                                                   00006480
ISN 0582          XXC(1) = 2.*XXC(1)                                            00006490
ISN 0583          XXC(3) = 2.*XXC(3)                                            00006500
ISN 0584          XXC(5) = 2.*XXC(5)                                            00006510
            C                                                                   00006520
            C     WE ARE STILL IN AN M (NODE POINT) LOOP. NOW SUM UP ALL THE    00006530
            C     EXTERNAL SPRING FORCES AND MOMENTS ACTING AT MASS I DUE TO    00006540
            C     EACH OF THE KOUNT NODE POINTS M.                              00006550
            C                                                                   00006560
ISN 0585     2010 DO 2020 J=1,6                                                 00006570
ISN 0586          XC(J) = XC(J)+XXC(J)                                          00006580
ISN 0587     2020 CONTINUE                                                      00006590
ISN 0588          CALL MATVEC(AI,DXYZ,DXYZPR,1)                                 00006600
ISN 0589          DO 260 K = 1,3                                                00006610
ISN 0590          IF(IISP(K).EQ.0) GO TO 260                                    00006620
ISN 0592          SUM = 0.                                                      00006630
ISN 0593          SUMF = 0.                                                     00006640
ISN 0594          DO 270 J = 1,3                                                00006650
ISN 0595          SUM = SUM-FSPB(J,K)*DXYZPR(J)                                 00006660
ISN 0596          SUMF = SUMF-FSPF(J,K)*DXYZPR(J)                               00006670
ISN 0597      270 CONTINUE                                                      00006680
ISN 0598          SUM1 = TERM(K)*DPQRIN(K)-TERM(K+3)*DPQRIN(K+1)                00006690
ISN 0599          SUMF1 = TERMF(K)*DPQRIN(K)-TERMF(K+3)*DPQRIN(K+1)             00006700
ISN 0600          DO 2050 IKM=1,NSP                                             00006710
ISN 0601          IF(I.EQ.II(IKM).AND.K.EQ.KK(IKM).AND.M.EQ.MM(IKM)) GO TO 2060 00006720
ISN 0603     2050 CONTINUE                                                      00006730
ISN 0604     2060 IF(M.EQ.0) GO TO 2030                                         00006740
ISN 0606          SUM1 = SUM1+FSPB(K,K)*ETERM(K)-ETB(K)                         00006750
ISN 0607          SUMF1 = SUMF1+FSPF(K,K)*ETERM(K)-ETF(K)                       00006760
```

```
ISN 0608     2030 CEIK(IKM) = CEIK(IKM)+SUM+SUM1
ISN 0609          CEIKF(IKM) = CEIKF(IKM)+SUMF+SUMF1
             C
             C    FOR A SYMMETRICAL MODEL WE MUST ADD CE AND FE CONTRIBUTIONS
             C    FROM THE OPPOSITE SPRINGS THAT ARE NOT INPUT EXPLICITLY.
             C
ISN 0610          IF(SYMFLG.NE.1.) GO TO 260
ISN 0612          IF(M.EQ.0.AND.YDP(I).EQ.0.) GO TO 260
ISN 0614          IF(M.EQ.0) GO TO 3000
ISN 0616          IF(YDP(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 260
ISN 0618     3000 CEIK(IKM) = CEIK(IKM)+SUM+SUM1
ISN 0619          CEIKF(IKM) = CEIKF(IKM)+SUMF+SUMF1
ISN 0620      260 CONTINUE
ISN 0621       20 CONTINUE
ISN 0622          RETURN
ISN 0623          END
```

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*******************************************************************************
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*                                                                             *
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        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                           SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334DAIN  AT LEVEL 003 AS OF 07/19/78
ISN 0002            SUBROUTINE DATIN(X,NAME,NWDS,UNIT,ERROR)
              C
              CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
              C                                                                    C
              C                                                                    C
              C     RETRIEVES VARIABLE AND ASSOCIATED VALUES FROM STORAGE          C
              C                                                                    C
              C     ARGS :  X      - STORAGE LOCATION WHERE VALUES RETRIEVED ARE   C
              C                      TO BE STORED                                  C
              C             NAME   - LITERAL NAME OF VARIABLE TO BE RETRIEVED      C
              C                      (8 CHAR MAX)                                  C
              C             NWDS   - NUMBER OF VALUES TO RETURN                    C
              C             UNIT   - UNIT WHERE MASTER DATA SET IS MOUNTED         C
              C             ERROR  - FLAG; ERROR FLAG                              C
              C                                                                    C
              C                                                                    C
              CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
              C
ISN 0003            INTEGER X(1),TEMP(4),RECORD(250),ERROR,UNIT,END1
ISN 0004            DOUBLE PRECISION NAME,DUMMY,START,BLANK,END
ISN 0005            EQUIVALENCE (DUMMY,TEMP(1)),(JWDS,TEMP(4))
ISN 0006            DATA LRECL/250/,START/'**START*'/,BLANK/'        '/,
                   1     END/'*END*END'/, JWDS/-1/, END1/'*END'/
              C
              C  ...GET VARIABLE NAME AND NUMBER OF VALUES...
              C
ISN 0007            ERROR = 0
ISN 0008            IF (JWDS .GT. 0) GO TO 5
ISN 0010              PRINT 6000
ISN 0011              ERROR = 22
ISN 0012              RETURN
ISN 0013          5 DO 20 I = 1,3
ISN 0014              IF (JWDS .LT. LRECL) GO TO 10
ISN 0016                READ (UNIT,END=99) RECORD
ISN 0017                JWDS = 0
ISN 0018         10   JWDS = JWDS +1
ISN 0019         20   TEMP(I) = RECORD(JWDS)
              C
              C     ...CHECK IF END OF DATA...
              C
```

```
ISN 0020          IF (DUMMY .NE. END) GO TO 30                          00000410
ISN 0022            PRINT 1000,NAME                                     00000420
ISN 0023            JWDS = JWDS - 3                                     00000430
ISN 0024            ERROR = 25                                          00000440
ISN 0025            RETURN                                              00000450
            C                                                           00000460
ISN 0026      30  IF (NAME .EQ. BLANK) NAME = DUMMY                     00000470
            C                                                           00000480
            C     ...GET VALUES...                                      00000490
            C                                                           00000500
ISN 0028      40  NREC = TEMP(3)                                        00000510
ISN 0029          NSTORE = NREC                                         00000520
ISN 0030          IF (NREC .GT. NWDS) NSTORE = NWDS                     00000530
ISN 0032          IF (NAME .NE. DUMMY) NSTORE = 0                       00000540
ISN 0034          IF (NREC .LE. 0)  GO TO 70                            00000550
ISN 0036          DO 60 I=1,NREC                                        00000560
ISN 0037            IF (JWDS .LT. LRECL) GO TO 50                       00000570
ISN 0039              READ (UNIT,END=99) RECORD                         00000580
ISN 0040              JWDS = 0                                          00000590
ISN 0041      50    JWDS = JWDS +1                                      00000600
ISN 0042            IF (I .LE. NSTORE) X(I) = RECORD(JWDS)              00000610
ISN 0044      60  CONTINUE                                              00000620
ISN 0045      70  ERROR = -NSTORE                                       00000630
ISN 0046          RETURN                                                00000640
ISN 0047      99  ERROR = 20                                            00000650
ISN 0048          PRINT 3000,NAME                                       00000660
ISN 0049          RETURN                                                00000670
            C                                                           00000680
            C                                                           00000690
            C  ...READ HEADER...                                        00000700
            C                                                           00000710
            C                                                           00000720
            C                                                           00000730
ISN 0050          ENTRY OPNIN(HEADER,NWDS,UNIT,ERROR)                   00000740
ISN 0051          INTEGER HEADER(1)                                     00000750
ISN 0052          ERROR = 0                                             00000760
ISN 0053          JWDS = 3                                              00000770
ISN 0054     100  READ (UNIT,END=199) RECORD                            00000780
ISN 0055          TEMP(1) = RECORD(1)                                   00000790
ISN 0056          TEMP(2) = RECORD(2)                                   00000800
ISN 0057          IF (DUMMY .NE. START) GO TO 100                       00000810
ISN 0059          NREC = RECORD(3)                                      00000820
ISN 0060          IF (NREC .LT. 1) RETURN                               00000830
ISN 0062          DO 120 I = 1,NREC                                     00000840
ISN 0063            JWDS = JWDS +1                                      00000850
ISN 0064            IF (I .LE. NWDS) HEADER(I) = RECORD(JWDS)           00000860
ISN 0066     120  CONTINUE                                              00000870
ISN 0067          RETURN                                                00000880
ISN 0068     199  CONTINUE                                              00000890
ISN 0069          ERROR = 10                                            00000900
ISN 0070          PRINT 4000                                            00000910
ISN 0071          RETURN                                                00000920
            C                                                           00000930
```

```
                C                                                                  00000940
                C  ...POSITION TO END OF DATA SET...                               00000950
                C                                                                  00000960
                C                                                                  00000970
ISN 0072              ENTRY CLSIN(UNIT,ERROR)                                      00000980
ISN 0073              JWDS = -1                                                    00000990
ISN 0074              ERROR = 0                                                    00001000
ISN 0075          200 IF (RECORD(LRECL) .EQ. END1) RETURN                          00001010
ISN 0077              READ (UNIT,END=299) RECORD                                   00001020
ISN 0078              GO TO 200                                                    00001030
ISN 0079          299 CONTINUE                                                     00001040
ISN 0080              ERROR = 30                                                   00001050
ISN 0081              PRINT 5000                                                   00001060
ISN 0082              RETURN                                                       00001070
                C                                                                  00001080
                C  ...FORMATS...                                                   00001090
                C                                                                  00001100
ISN 0083         1000 FORMAT(1H0,10X,'11. ****ERROR - END OF DATA REACHED AT',     00001110
                    1                ' VARIABLE ',A8,'****')                       00001120
ISN 0084         3000 FORMAT(1H0,10X,'12. ****ERROR - END OF FILE REACHED AT',     00001130
                    1                ' VARIABLE ',A8,'****')                       00001140
ISN 0085         4000 FORMAT(1H0,10X,'13. ****ERROR - END OF FILE REACHED TRYING TO',  00001150
                    1                ' OPEN DATA SET FOR READING****')             00001160
ISN 0086         5000 FORMAT(1H0,10X,'14. ****ERROR - EOF TRYING TO CLOSE DATA SET',   00001170
                    1                ' AFTER READING****')                         00001180
ISN 0087         6000 FORMAT(1H0,10X,'15. ****ERROR - CANNOT READ DATA WITHOUT',   00001190
                    1                ' FIRST OPENING DESIRED DATA SET****')        00001200
ISN 0088              END                                                          00001210
```

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**************************************************************************************************
*                                                                                                *
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*         LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                           *
*                                                                                                *
**************************************************************************************************

      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C          DATA SET D2334DAOUT AT LEVEL 008 AS OF 03/23/79
            C          DATA SET D2332ZDATO AT LEVEL 007 AS OF 07/19/78
            C          INCREASE NUMBER OF BACKSPACES TO 5.  3-20-79 WJL
ISN 0002          SUBROUTINE DATOUT(X,NAME,NWDS,UNIT,ERROR)
ISN 0003          DIMENSION X(1),TEMP(4),RECORD(250)
ISN 0004          INTEGER X,UNIT,ERROR,TEMP,RECORD
ISN 0005          DOUBLE PRECISION NAME,DUMMY
ISN 0006          EQUIVALENCE (DUMMY,TEMP(1)),(JWDS,TEMP(4))
ISN 0007          DATA LRECL/250/, JWDS/-1/
            C
            C  ...WRITE VARIABLE DEFINITION DATA...
            C
ISN 0008          IF (JWDS .GT. 0) GO TO 10
ISN 0010             PRINT 1000
ISN 0011             ERROR = 42
ISN 0012             RETURN
ISN 0013       10 IF (NWDS .LT. 1000000) GO TO 15
ISN 0015             PRINT 2000,NWDS
ISN 0016             ERROR = 47
ISN 0017             RETURN
ISN 0018       15 DUMMY = NAME
ISN 0019          TEMP(3) = NWDS
ISN 0020          ERROR = 0
ISN 0021          DO 30 I = 1,3
ISN 0022            IF (JWDS .LT. LRECL) GO TO 20
ISN 0024              WRITE (UNIT) RECORD
ISN 0025              JWDS = 0
ISN 0026       20   JWDS = JWDS +1
ISN 0027       30   RECORD(JWDS) = TEMP(I)
ISN 0028          IF (NWDS .LE. 0) RETURN
            C
            C     ...WRITE VARIABLE VALUES...
            C
ISN 0030          DO 60 I = 1,NWDS
ISN 0031            IF (JWDS .LT. LRECL) GO TO 50
ISN 0033              WRITE (UNIT) RECORD
ISN 0034              JWDS = 0
ISN 0035       50   JWDS = JWDS +1
ISN 0036       60   RECORD(JWDS) = X(I)
ISN 0037          RETURN
            C
```

```
              C
              C  ...WRITING HEADER INFORMATION...
              C
              C
ISN 0038            ENTRY OPNOUT(UNIT)
ISN 0039            INTEGER DSN(1),DATE(5)
ISN 0040            INTEGER ACCARD(22) /22*0/
ISN 0041            INTEGER HEAD(3)/'**ST','ART*','*END'/
              C
              C     ...FIND LAST RECORD WRITTEN...
              C
ISN 0042        100 READ (UNIT,END=105)
ISN 0043            GO TO 100
ISN 0044        105 CONTINUE
              C
              C       TAPE IS BACKSPACED TWICE TO POSITION TAPE HEAD AT BEGINNING
              C       OF LAST RECORD.
              C
ISN 0045            DO 106 J=1,2
ISN 0046            BACKSPACE UNIT
ISN 0047        106 CONTINUE
              C
              C       LAST RECORD IS READ AGAIN, TO POSITION TAPE FOR NEXT WRITE,
              C       WHICH WILL DESTROY EOF TAPE MARK.
              C
ISN 0048            READ(21) RECORD
              C
              C     ...WRITE HEADER...
              C
ISN 0049            DO 107  I=1,22
ISN 0050        107   ACCARD(I) = 0
ISN 0051            RECORD(1) = HEAD(1)
ISN 0052            RECORD(2) = HEAD(2)
ISN 0053            CALL CDATE(DATE,0)
ISN 0054            RECORD(3) = 24
ISN 0055            RECORD(4) = DATE(1)
ISN 0056            RECORD(5) = DATE(2)
ISN 0057            CALL JOBAC(ACCARD)
ISN 0058            DO 110 I = 1,22
ISN 0059              JWDS = I + 5
ISN 0060        110   RECORD(JWDS) = ACCARD(I)
ISN 0061            RETURN
              C
              C
              C  ...WRITE CLOSING INFORMATION...
              C
              C
ISN 0062            ENTRY CLSOUT(UNIT)
ISN 0063            IF (JWDS .LT. LRECL) GO TO 200
ISN 0065              WRITE (UNIT) RECORD
ISN 0066              JWDS = 0
ISN 0067        200 JWDS = JWDS +1
ISN 0068            DO 210 I = JWDS, LRECL
```

```
ISN 0069      210    RECORD(I) = HEAD(3)
ISN 0070           WRITE (UNIT) RECORD
              C
              C          TAPE FILE IS ENDED, THEN BACKSPACED TWICE TO POSITION
              C          TAPE HEAD TO BEGINNING OF LAST RECORD.  THAT RECORD IS
              C          THEN READ, AND NEXT READ WILL ENCOUNTER EOF.
              C
ISN 0071           END FILE UNIT
ISN 0072           DO 215 J=1,2
ISN 0073           BACKSPACE UNIT
ISN 0074       215 CONTINUE
ISN 0075           READ(21) RECORD
ISN 0076           JWDS = -1
ISN 0077           RETURN
ISN 0078      1000 FORMAT(1H0,10X,'16. ****ERROR - MUST OPEN DATA SET BEFORE',
                  1             'WRITING DATA OUT****')
ISN 0079      2000 FORMAT(1H0,10X,'17. **WARNING - REQUESTED STORING ',I9,
                  1             ' VALUES.  STORE FAILED**')
ISN 0080           END
```

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     ***********************************************************************************************
     *                                                                                             *
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     ***********************************************************************************************

        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                           SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                    C          DATA SET D2334DERIV AT LEVEL 010 AS OF 06/25/79
                    C          DATA SET D2332VDE   AT LEVEL 009 AS OF 02/09/78                 00000010
  ISN 0002                SUBROUTINE DERIV                                                     00000020
                    C                                                                          00000030
                    C     DELTAVB/DELTAT VERSION                                               00000040
                    C                                                                          00000050
  ISN 0003                IMPLICIT REAL*8 (A-H,O-Z)                                            00000060
  ISN 0004                REAL*8 KETOTL,KEI                                                    00000070
  ISN 0005                REAL*8 KUN,KR(6)                                                     00000080
  ISN 0006                REAL*8 MX,MY,MZ,MYI,MYJ,MZI,MZJ,MINDT                                00000090
  ISN 0007                REAL*4 XKS,XKI,XKR,AXK,PTR,CLTEST                                    00000100
  ISN 0008                INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                          00000110
  ISN 0009                INTEGER*4 TITLE(40),BPL(100,3)                                       00000120
  ISN 0010                INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)                00000130
  ISN 0011                INTEGER*2 NLSFLG,CHUG,N1,IJPR,NN                                     00000140
  ISN 0012                INTEGER*2 INBUFF,IG,JG                                               00000150
  ISN 0013                INTEGER*2 MG(150),NG(150),INP(50),MNP(50),II(40),KK(40),MM(40)       00000160
  ISN 0014                DIMENSION IRUPSW(150),IPENSW(80),SINCOS(6),CIJ(720),DAI(9),          00000170
                         1 D(9),AIAIJT(9),AP(9)                                                00000180
  ISN 0015                DIMENSION VBOT(6),FEE(900)                                           00000190
  ISN 0016                DIMENSION XVOL(6,3),VOLLEN(5,3)                                      00000200
  ISN 0017                DIMENSION SS(4),SAX(4)                                               00000210
  ISN 0018                DIMENSION RX(50),RY(50),RZ(50),UNP(50),VNP(50),WNP(50)               00000220
  ISN 0019                DIMENSION XNP(50),YNP(50),ZNP(50),DXNP(50),DYNP(50),DZNP(50)         00000230
  ISN 0020                DIMENSION XDNP(50),YDNP(50),ZDNP(50)                                 00000240
  ISN 0021                DIMENSION XACCNP(50),YACCNP(50),ZACCNP(50)                           00000250
  ISN 0022                DIMENSION XNPOLD(50),YNPOLD(50),ZNPOLD(50)                           00000260
  ISN 0023                DIMENSION FDI(6),FSI(6),VJ(6),VI(6),VEL(9),                          00000270
                         1          VEEBAR(900),DPHIIJ(150)                                    00000280
  ISN 0024                DIMENSION TEMP(9),SUMM(9),AIJTAJ(9),AIJTAI(9),DJ(6),DI(6),           00000290
                         1          DFJ(6),DFI(6),FSJ(6),FDJ(6)                                00000300
  ISN 0025                COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),        00000310
                         1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000320
                         2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),     00000330
                         3 MVP                                                                 00000340
  ISN 0026                COMMON/DOIN/ CBAR(150)                                               00000350
  ISN 0027                COMMON/DEIR/ PLM26(150),PLM35(150),PLM26J(150),PLM35J(150)           00000360
  ISN 0028                COMMON/DEMA/ DEVMAX                                                  00000370
  ISN 0029                COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),             00000380
                         1          FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)          00000390
  ISN 0030                COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),              00000400
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              1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),      00000410
              2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                       00000420
ISN 0031        COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),       00000430
              1                XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,      00000440
              2                PETOTL,SETOTL,DETOTL,CETOTL,FETOTL                  00000450
ISN 0032        COMMON/MADE/KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,          00000460
              1 TPL(100),BPL,KPL                                                   00000470
ISN 0033        COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),         00000480
              1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)            00000490
ISN 0034        COMMON/INDEAC/ NACC                                                 00000500
ISN 0035        COMMON/INIDCP/ YDP(80)                                              00000510
ISN 0036        COMMON/INPR/ NDRI,NSP                                               00000520
ISN 0037        COMMON                  XX(80),XY(80),XZ(80),XL(80),XM(80),         00000530
              1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),    00000540
              2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),   00000550
              5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),             00000560
              6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),    00000570
              7 PHIOLD(80),THEOLD(80),PSIOLD(80),                                  00000580
              8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),    00000590
              9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),    00000600
              A TKR(200),TPEN(80),DTHALF,                                          00000610
              B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT                     00000620
ISN 0038        COMMON/MCFIII/ SYMFLG                                               00000630
ISN 0039        COMMON/NP00I2/ MG,NG,INP,MNP                                        00000640
ISN 0040        COMMON/NP01I2/ II,KK,MM                                             00000650
ISN 0041        COMMON/NP00I4/ NNP                                                  00000660
ISN 0042        COMMON/NP00R8/ RX,RY,RZ                                             00000670
ISN 0043        COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,              00000680
              1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                          00000690
ISN 0044        COMMON/DEIC/ WTOT,CLTEST(150)                                       00000700
ISN 0045        COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),          00000710
              1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),     00000720
              2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO           00000730
ISN 0046        COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),      00000740
              1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),       00000750
              2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),            00000760
              3 YIMNPL(50),ZIMNPL(50)                                              00000770
ISN 0047        COMMON/IRDE/ PFIL                                                   00000780
ISN 0048        COMMON/UB/ DB(150),IJUB(150),NUB                                    00000790
ISN 0049        COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000800
              1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),              00000810
              2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),             00000820
              3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),      00000830
              4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),    00000840
              5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,    00000850
              6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                               00000860
              7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,               00000870
              8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),             00000880
              9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),           00000890
              A CEIKF(40),                                                         00000900
              B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                              00000910
              C NM,NB,I,J,IG(150),JG(150),                                         00000920
              D NI(900),NN(40),IJPR(150)                                           00000930
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ISN 0050        COMMON /MAX/ IRUPSW(150),IPENSW(80),VEEBAR(900),ZINIT(80),       00000940
               1                 DPHIIJ(150),FUB(150)                            00000950
ISN 0051        COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR    00000960
ISN 0052        COMMON /MACFIN/ TMAX,IPRINT                                      00000970
ISN 0053        EQUIVALENCE (S1,SINCOS(1)),(C1,SINCOS(2)),(S2,SINCOS(3)),        00000980
               1          (C2,SINCOS(4)),(S3,SINCOS(5)),(C3,SINCOS(6))           00000990
ISN 0054        SQRT(X) = DSQRT(X)                                               00001000
ISN 0055        SIN(X) = DSIN(X)                                                 00001010
ISN 0056        COS(X) = DCOS(X)                                                 00001020
ISN 0057        SIGN(X1,X2) = DSIGN(X1,X2)                                       00001030
ISN 0058        ABS(X) = DABS(X)                                                 00001040
ISN 0059        AMAX1(X,Y) = DMAX1(X,Y)                                          00001050
ISN 0060        ATAN2(Y,X) = DATAN2(Y,X)                                         00001060
ISN 0061        TANH(X)=DTANH(X)                                                 00001070
ISN 0062        ONE = 1.                                                         00001080
ISN 0063        TT = .2                                                          00001090
ISN 0064        ET = .8                                                          00001100
ISN 0065        S = DELTAT                                                       00001110
ISN 0066        PI2 = 3.14159265358979324D0/2.                                   00001120
ISN 0067        ERR = 0.                                                         00001130
ISN 0068        IF(TIME.NE.0.0) GO TO 60                                         00001140
ISN 0070        DO 70 IJ = 1,NB                                                  00001150
ISN 0071        PHIIJ(IJ) = 0.                                                   00001160
ISN 0072        DPHIIJ(IJ) = 0.                                                  00001170
ISN 0073        VEEN(1,IJ) = 0.                                                  00001180
ISN 0074        VEEN(2,IJ) = 0.                                                  00001190
ISN 0075        DO 71 K=1,6                                                      00001200
ISN 0076     71 SUMDFI(K,IJ) = 0.                                                00001210
ISN 0077     70 IRUPSW(IJ) = 0                                                   00001220
ISN 0078        DO 72 I=1,NM                                                     00001230
ISN 0079        XSE(I) = 0.                                                      00001240
ISN 0080        XDE(I) = 0.                                                      00001250
ISN 0081     72 IPENSW(I)=0                                                      00001260
ISN 0082        NB9 = 9*NB                                                       00001270
ISN 0083        DO 74 I = 1,NB9                                                  00001280
ISN 0084        VEEBAR(I) = 0.                                                   00001290
ISN 0085     74 CONTINUE                                                         00001300
             C DO ALL THE (AI)((AJ))                                             00001310
ISN 0086     60 DO 10 I = 1,NM                                                   00001320
ISN 0087        ARG = PHI(I)                                                     00001330
ISN 0088        S1 = SIN(ARG)                                                    00001340
ISN 0089        C1 = COS(ARG)                                                    00001350
ISN 0090        ARG = THETA(I)                                                   00001360
ISN 0091        S2 = SIN(ARG)                                                    00001370
ISN 0092        C2 = COS(ARG)                                                    00001380
ISN 0093        ARG = PSI(I)                                                     00001390
ISN 0094        S3 = SIN(ARG)                                                    00001400
ISN 0095        C3 = COS(ARG)                                                    00001410
ISN 0096        DO 40 J = 1,6                                                    00001420
ISN 0097        T = SINCOS(J)                                                    00001430
ISN 0098        IF(T) 45,40,50                                                   00001440
ISN 0099     45 T = -T                                                           00001450
ISN 0100     50 IF(T-1.E-10) 55,40,40                                            00001460
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ISN 0101        55 SINCOS(J) = 0.0                                      00001470
ISN 0102        40 CONTINUE                                             00001480
             C                                                          00001490
ISN 0103           J = 9*(I-1)                                          00001500
             C MOVE AI S TO OLD AI S                                    00001510
ISN 0104           DO 4 J1 = 1,9                                        00001520
ISN 0105         4 OAI(J+J1) = BIJ(J+J1)                                00001530
ISN 0106           S1S2 = S1*S2                                         00001540
ISN 0107           C1S2 = C1*S2                                         00001550
ISN 0108           AI(1) = C2*C3                                        00001560
ISN 0109           BIJ(J+1) = AI(1)                                     00001570
ISN 0110           AI(2) = C2*S3                                        00001580
ISN 0111           BIJ(J+2) = AI(2)                                     00001590
ISN 0112           AI(3) = -S2                                          00001600
ISN 0113           BIJ(J+3) = AI(3)                                     00001610
ISN 0114           AI(4) = -C1*S3+S1S2*C3                               00001620
ISN 0115           BIJ(J+4) = AI(4)                                     00001630
ISN 0116           AI(5) = C1*C3+S1S2*S3                                00001640
ISN 0117           BIJ(J+5) = AI(5)                                     00001650
ISN 0118           AI(6) = S1*C2                                        00001660
ISN 0119           BIJ(J+6) = AI(6)                                     00001670
ISN 0120           AI(7) = S1*S3+C1S2*C3                                00001680
ISN 0121           BIJ(J+7) = AI(7)                                     00001690
ISN 0122           AI(8) = -S1*C3+C1S2*S3                               00001700
ISN 0123           BIJ(J+8) = AI(8)                                     00001710
ISN 0124           AI(9) = C1*C2                                        00001720
ISN 0125           BIJ(J+9) = AI(9)                                     00001730
             C (27)                                                     00001740
ISN 0126           PP = P(I)                                            00001750
ISN 0127           QQ = Q(I)                                            00001760
ISN 0128           RR = R(I)                                            00001770
ISN 0129           UU = U(I)                                            00001780
ISN 0130           VV = V(I)                                            00001790
ISN 0131           WW = W(I)                                            00001800
ISN 0132           XDOT(I) = AI(1)*UU+AI(4)*VV+AI(7)*WW                 00001810
ISN 0133           YDOT(I) = AI(2)*UU+AI(5)*VV+AI(8)*WW                 00001820
ISN 0134           ZDOT(I) = AI(3)*UU+AI(6)*VV+AI(9)*WW                 00001830
             C (28),(29)                                                00001840
ISN 0135           CS = S1/C2                                           00001850
ISN 0136           CC = C1/C2                                           00001860
ISN 0137           PHIDOT(I) = PP+QQ*CS*S2+RR*CC*S2                     00001870
ISN 0138           THEDOT(I) = QQ*C1-RR*S1                              00001880
ISN 0139           PSIDOT(I) = QQ*CS+RR*CC                              00001890
             C DO AIDOT NOW                                             00001900
ISN 0140           T = PSIDOT(I)*C2                                     00001910
ISN 0141           T1 = THEDOT(I)*S1-T*C1                               00001920
ISN 0142           T2 = THEDOT(I)*C1+T*S1                               00001930
ISN 0143           T3 = PHIDOT(I)-PSIDOT(I)*S2                          00001940
ISN 0144           CIJ(J+1)= -BIJ(J+4)*T1-BIJ(J+7)*T2                   00001950
ISN 0145           CIJ(J+4)=  BIJ(J+1)*T1+BIJ(J+7)*T3                   00001960
ISN 0146           CIJ(J+7)=  BIJ(J+1)*T2-BIJ(J+4)*T3                   00001970
ISN 0147           CIJ(J+2)= -BIJ(J+5)*T1-BIJ(J+8)*T2                   00001980
ISN 0148           CIJ(J+5)=  BIJ(J+2)*T1+BIJ(J+8)*T3                   00001990
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ISN 0149            CIJ(J+8)=  BIJ(J+2)*T2-BIJ(J+5)*T3
ISN 0150            CIJ(J+3)= -BIJ(J+6)*T1-BIJ(J+9)*T2
ISN 0151            CIJ(J+6)=  BIJ(J+3)*T1+BIJ(J+9)*T3
ISN 0152            CIJ(J+9)=  BIJ(J+3)*T2-BIJ(J+6)*T3
ISN 0153         10 CONTINUE
               C
               C    THE FOLLOWING CODING GETS THE VEHICLE C.G. TRANSLATIONAL
               C    VELOCITY IN GROUND AXES BY EQUATING THE VEHICLE LINEAR
               C    MOMENTUM WITH THE SUM OF THE MOMENTA OF ALL THE INDIVIDUAL
               C    LUMPED MASSES.
               C
ISN 0154            SUMWXD = 0.
ISN 0155            SUMWYD = 0.
ISN 0156            SUMWZD = 0.
ISN 0157            SUMW = 0.
ISN 0158            DO 12 I=1,NM
ISN 0159            SUMW = SUMW+WGT(I)
ISN 0160            SUMWXD = SUMWXD+WGT(I)*XDOT(I)
ISN 0161            SUMWYD = SUMWYD+WGT(I)*YDOT(I)
ISN 0162            SUMWZD = SUMWZD+WGT(I)*ZDOT(I)
               C
               C    FOR A SYMMETRICAL MODEL WE MUST ADD THE MOMENTUM CONTRIBUTIONS
               C    FROM THE OPPOSITE MASSES THAT ARE NOT INPUT EXPLICITLY.
               C
ISN 0163            IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 12
ISN 0165            SUMW = SUMW+WGT(I)
ISN 0166            SUMWXD = SUMWXD+WGT(I)*XDOT(I)
ISN 0167            SUMWYD = SUMWYD-WGT(I)*YDOT(I)
ISN 0168            SUMWZD = SUMWZD+WGT(I)*ZDOT(I)
ISN 0169         12 CONTINUE
ISN 0170            XDOTAP = SUMWXD/SUMW
ISN 0171            YDOTAP = SUMWYD/SUMW
ISN 0172            ZDOTAP = SUMWZD/SUMW
               C
               C    FOR THE MAIN INTERNAL BEAM LOOP (DO 1000), WE NEED XNP(J),
               C    DXNP(J), AND UNP(J) FOR THE NODE POINTS.
               C
ISN 0173            IF(NNP.EQ.0) GO TO 16
ISN 0175            DO 14 J=1,NNP
ISN 0176            XNPOLD(J) = XNP(J)
ISN 0177            YNPOLD(J) = YNP(J)
ISN 0178            ZNPOLD(J) = ZNP(J)
ISN 0179            I = INP(J)
ISN 0180            IS = 9*(I-1)
ISN 0181            DO 15 KS=1,9
ISN 0182            IS = IS+1
ISN 0183            AI(KS) = BIJ(IS)
ISN 0184         15 CONTINUE
ISN 0185            TX = AI(1)*RX(J)+AI(4)*RY(J)+AI(7)*RZ(J)
ISN 0186            TY = AI(2)*RX(J)+AI(5)*RY(J)+AI(8)*RZ(J)
ISN 0187            TZ = AI(3)*RX(J)+AI(6)*RY(J)+AI(9)*RZ(J)
ISN 0188            XNP(J) = X(I)+TX
ISN 0189            YNP(J) = Y(I)+TY
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ISN 0190          ZNP(J) = Z(I)+TZ
ISN 0191          DXNP(J) = XNP(J)-XNPOLD(J)
ISN 0192          DYNP(J) = YNP(J)-YNPOLD(J)
ISN 0193          DZNP(J) = ZNP(J)-ZNPOLD(J)
ISN 0194          OMCRX = -R(I)*RY(J)+Q(I)*RZ(J)
ISN 0195          OMCRY =  R(I)*RX(J)-P(I)*RZ(J)
ISN 0196          OMCRZ = -Q(I)*RX(J)+P(I)*RY(J)
ISN 0197          UNP(J) = U(I)+OMCRX
ISN 0198          VNP(J) = V(I)+OMCRY
ISN 0199          WNP(J) = W(I)+OMCRZ
ISN 0200          IF(TIME.NE.0.) GO TO 14
ISN 0202          DXNP(J) = 0.
ISN 0203          DYNP(J) = 0.
ISN 0204          DZNP(J) = 0.
ISN 0205       14 CONTINUE
             C
             C  ZERO OUT BEAM FORCES ON MASSES.
             C
ISN 0206       16 DO 18 I=1,NM
ISN 0207          XX(I) = 0.
ISN 0208          XY(I) = 0.
ISN 0209          XZ(I) = 0.
ISN 0210          XL(I) = 0.
ISN 0211          XM(I) = 0.
ISN 0212          XN(I) = 0.
ISN 0213       18 CONTINUE
ISN 0214          ILAST = 0
             C
             C DO 1000 IS MAIN DO LOOP TO GET TOTAL INTERNAL FORCES AND MOMENTS
             C
ISN 0215          DO 1000 IJ = 1,NB
ISN 0216          IJK = 6*(IJ-1)
ISN 0217          IF(IRUPSW(IJ).NE.0) GO TO 1000
ISN 0219          I = IG(IJ)
ISN 0220          J = JG(IJ)
ISN 0221          M = MG(IJ)
ISN 0222          N = NG(IJ)
             C IF WE GET TO A NEW I WE MUST MOVE (AI) INTO AI.
ISN 0223          IF(I-ILAST) 20,30,20
ISN 0224       20 ILAST = I
ISN 0225          IS = 9*(I-1)
ISN 0226          DO 320 KS = 1,9
ISN 0227          IS = IS+1
ISN 0228          AIDOT(KS) = CIJ(IS)
ISN 0229      320 AI(KS) = BIJ(IS)
             C
             C    NOW GET AJ.
             C
ISN 0230       30 IS = 9*(J-1)
ISN 0231          DO 3201 KS=1,9
ISN 0232          IS = IS+1
ISN 0233          IF(J.EQ.0) GO TO 3202
ISN 0235          AJ(KS) = BIJ(IS)
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ISN 0236           GO TO 3201
ISN 0237      3202 AJ(KS) = AI(KS)
ISN 0238           IF(KS.EQ.2.OR.KS.EQ.4.OR.KS.EQ.6.OR.KS.EQ.8) AJ(KS) = -AJ(KS)
ISN 0240      3201 CONTINUE
              C
              C    IF J.EQ.0,WE HAVE A SYMMETRICAL MODEL IN WHICH BEAM IJ
              C    CONNECTS NODE POINT (I,M) TO AN IMAGINARY POINT (J,N=0)
              C    LOCATED SYMMETRICALLY ACROSS THE AIRPLANE PLANE OF SYMMETRY
              C    (X-Z PLANE). FOR THESE TRANSVERSE BEAMS,THE CONDITIONS AT (J,N)
              C    ARE DEDUCED FROM THE STATE AT (I,M). J IS CHANGED TO 81 BECAUSE
              C    THE IBM 360-91 WILL NOT ACCEPT A ZERO SUBSCRIPTED VECTOR.
              C
ISN 0241           IF(J.NE.0) GO TO 3300
ISN 0243           J = 81
ISN 0244           IF(M.NE.0) GO TO 3301
              C
              C    IF M.EQ.0,THERE IS NO NODE POINT AT I.
              C
ISN 0246      3302 DXMODI = DX(I)
ISN 0247           DYMODI = DY(I)
ISN 0248           DZMODI = DZ(I)
ISN 0249           XMODI = X(I)
ISN 0250           YMODI = Y(I)
ISN 0251           ZMODI = Z(I)
ISN 0252           UMODI = U(I)
ISN 0253           VMODI = V(I)
ISN 0254           WMODI = W(I)
ISN 0255           PI = P(I)
ISN 0256           QI = Q(I)
ISN 0257           RI = R(I)
ISN 0258           GO TO 3303
              C
              C    THIS LOOP GETS NODE POINT NUMBER JI KNOWING I AND M.
              C
ISN 0259      3301 DO 3305 JI=1,NNP
ISN 0260           IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 3306
ISN 0262      3305 CONTINUE
ISN 0263      3306 DXMODI = DXNP(JI)
ISN 0264           DYMODI = DYNP(JI)
ISN 0265           DZMODI = DZNP(JI)
ISN 0266           XMODI = XNP(JI)
ISN 0267           YMODI = YNP(JI)
ISN 0268           ZMODI = ZNP(JI)
ISN 0269           UMODI = UNP(JI)
ISN 0270           VMODI = VNP(JI)
ISN 0271           WMODI = WNP(JI)
ISN 0272           PI = P(I)
ISN 0273           QI = Q(I)
ISN 0274           RI = R(I)
ISN 0275      3303 IF(J.NE.81) GO TO 3310
              C
              C    IF J.EQ.81,WE HAVE A SYMMETRICAL MODEL. NOW CALCULATE
              C    CONDITIONS AT J,N BASED ON KNOWLEDGE OF STATE AT I,M.
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                C                                                                  00003590
ISN 0277              DXMODJ =  DXMODI                                             00003600
ISN 0278              DYMODJ = -DYMODI                                             00003610
ISN 0279              DZMODJ =  DZMODI                                             00003620
ISN 0280              XMODJ = XMODI                                                00003630
ISN 0281              YMODJ = -YMODI                                               00003640
ISN 0282              ZMODJ =  ZMODI                                               00003650
ISN 0283              DPIN(J) = -DPIN(I)                                           00003660
ISN 0284              DQIN(J) =  DQIN(I)                                           00003670
ISN 0285              DRIN(J) = -DRIN(I)                                           00003680
ISN 0286              UMODJ = UMODI                                                00003690
ISN 0287              VMODJ =-VMODI                                                00003700
ISN 0288              WMODJ = WMODI                                                00003710
ISN 0289              PJ =-PI                                                      00003720
ISN 0290              QJ = QI                                                      00003730
ISN 0291              RJ =-RI                                                      00003740
ISN 0292              GO TO 3320                                                   00003750
ISN 0293         3300 IF(M.EQ.0) GO TO 3302                                        00003760
ISN 0295              GO TO 3301                                                   00003770
ISN 0296         3310 IF(N.NE.0) GO TO 3311                                        00003780
                C                                                                  00003790
                C     IF N.EQ.0,THERE IS NO NODE POINT AT J.                       00003800
                C                                                                  00003810
ISN 0298              DXMODJ = DX(J)                                               00003820
ISN 0299              DYMODJ = DY(J)                                               00003830
ISN 0300              DZMODJ = DZ(J)                                               00003840
ISN 0301              XMODJ = X(J)                                                 00003850
ISN 0302              YMODJ = Y(J)                                                 00003860
ISN 0303              ZMODJ = Z(J)                                                 00003870
ISN 0304              UMODJ = U(J)                                                 00003880
ISN 0305              VMODJ = V(J)                                                 00003890
ISN 0306              WMODJ = W(J)                                                 00003900
ISN 0307              PJ = P(J)                                                    00003910
ISN 0308              QJ = Q(J)                                                    00003920
ISN 0309              RJ = R(J)                                                    00003930
ISN 0310              GO TO 3320                                                   00003940
                C                                                                  00003950
                C     THIS LOOP GETS NODE POINT NUMBER JJ KNOWING J AND N.         00003960
                C                                                                  00003970
ISN 0311         3311 DO 3312 JJ=1,NNP                                             00003980
ISN 0312              IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 3313                 00003990
ISN 0314         3312 CONTINUE                                                     00004000
ISN 0315         3313 DXMODJ = DXNP(JJ)                                            00004010
ISN 0316              DYMODJ = DYNP(JJ)                                            00004020
ISN 0317              DZMODJ = DZNP(JJ)                                            00004030
ISN 0318              XMODJ = XNP(JJ)                                              00004040
ISN 0319              YMODJ = YNP(JJ)                                              00004050
ISN 0320              ZMODJ = ZNP(JJ)                                              00004060
ISN 0321              UMODJ = UNP(JJ)                                              00004070
ISN 0322              VMODJ = VNP(JJ)                                              00004080
ISN 0323              WMODJ = WNP(JJ)                                              00004090
ISN 0324              PJ = P(J)                                                    00004100
ISN 0325              QJ = Q(J)                                                    00004110
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ISN 0326          RJ = R(J)                                                     00004120
             C                                                                  00004130
             C    ALL OF THE ABOVE PATHS LEAD TO HERE. WE NOW HAVE POSITIONS    00004140
             C    (XMOD,ETC.) AND INCREMENTAL CHANGES IN POSITIONS (DXMOD,ETC.) 00004150
             C    FOR BOTH ENDS OF BEAM IJ.                                     00004160
             C                                                                  00004170
ISN 0327     3320 XIJ = XMODJ-XMODI                                             00004180
ISN 0328          YIJ = YMODJ-YMODI                                             00004190
ISN 0329          ZIJ = ZMODJ-ZMODI                                             00004200
             C                                                                  00004210
             C CALCULATE AIJ. FIRST UPDATE PHIIJ, THEIJ, PSIIJ.                 00004220
             C                                                                  00004230
ISN 0330          PHIIJ(IJ) = PHIIJ(IJ) + DPHIIJ(IJ)                            00004240
ISN 0331          IF(XIJ.EQ.0.AND.YIJ.EQ.0.) GO TO 3330                         00004250
ISN 0333          PSIIJ(IJ) = ATAN2(YIJ,XIJ)                                    00004260
ISN 0334          GO TO 3340                                                    00004270
ISN 0335     3330 PSIIJ(IJ) = 0.                                                00004280
ISN 0336     3340 THEIJ(IJ) = -ATAN2(ZIJ,SQRT(XIJ*XIJ+YIJ*YIJ))                 00004290
             C                                                                  00004300
             C  ZERO OUT VERY SMALL SIN AND COS TERMS.                          00004310
             C                                                                  00004320
ISN 0337          ARG = PHIIJ(IJ)                                               00004330
ISN 0338          S1 = SIN(ARG)                                                 00004340
ISN 0339          C1 = COS(ARG)                                                 00004350
ISN 0340          ARG = THEIJ(IJ)                                               00004360
ISN 0341          S2 = SIN(ARG)                                                 00004370
ISN 0342          C2 = COS(ARG)                                                 00004380
ISN 0343          ARG = PSIIJ(IJ)                                               00004390
ISN 0344          S3 = SIN(ARG)                                                 00004400
ISN 0345          C3 = COS(ARG)                                                 00004410
ISN 0346          DO 3392 J1 = 1,6                                              00004420
ISN 0347          T = SINCOS(J1)                                                00004430
ISN 0348          IF(T) 3394,3392,3398                                          00004440
ISN 0349     3394 T = -T                                                        00004450
ISN 0350     3398 IF(T-1.E-10) 3396,3392,3392                                   00004460
ISN 0351     3396 SINCOS(J1) = 0.0                                              00004470
ISN 0352     3392 CONTINUE                                                      00004480
ISN 0353          S1S2 = S1*S2                                                  00004490
ISN 0354          C1S2 = C1*S2                                                  00004500
ISN 0355          AIJ(1) = C2*C3                                                00004510
ISN 0356          AIJ(2) = C2*S3                                                00004520
ISN 0357          AIJ(3) = -S2                                                  00004530
ISN 0358          AIJ(4) = -C1*S3 + S1S2*C3                                     00004540
ISN 0359          AIJ(5) = C1*C3 + S1S2*S3                                      00004550
ISN 0360          AIJ(6) = S1*C2                                                00004560
ISN 0361          AIJ(7) = S1*S3 + C1S2*C3                                      00004570
ISN 0362          AIJ(8) =-S1*C3 + C1S2*S3                                      00004580
ISN 0363          AIJ(9) = C1*C2                                                00004590
             C                                                                  00004600
             C  CALCULATE CURRENT BEAM LENGTH XXLB.                             00004610
             C                                                                  00004620
ISN 0364          XXLB = SQRT(XIJ*XIJ+YIJ*YIJ+ZIJ*ZIJ)                          00004630
             C                                                                  00004640
```

```
         C  CALCULATE AIJTAJ AND AIJTAI.  FILL TEMP WITH EITHER AJ OR AI.
         C
ISN 0365        DO 6000 I3=1,2
ISN 0366        DO 6010 I4=1,9
ISN 0367        IF(I3.EQ.2) GO TO 6020
ISN 0369        TEMP(I4) = AJ(I4)
ISN 0370        GO TO 6010
ISN 0371   6020 TEMP(I4) = AI(I4)
ISN 0372   6010 CONTINUE
ISN 0373        L2 = 0
ISN 0374        DO 6030 K2=1,3
ISN 0375        DO 6040 J2=1,3
ISN 0376        L2 = L2+1
ISN 0377        SUMM(L2) = 0.
ISN 0378        DO 6050 I2=1,3
ISN 0379        SUMM(L2) = SUMM(L2) + AIJ(3*(J2-1)+I2)*TEMP(3*(K2-1)+I2)
ISN 0380   6050 CONTINUE
ISN 0381        IF(I3.EQ.2) GO TO 6060
ISN 0383        AIJTAJ(L2) = SUMM(L2)
ISN 0384        GO TO 6040
ISN 0385   6060 AIJTAI(L2) = SUMM(L2)
ISN 0386   6040 CONTINUE
ISN 0387   6030 CONTINUE
ISN 0388   6000 CONTINUE
         C
         C  CALCULATE VELOCITIES AND INCREMENTAL DEFLECTIONS AT J,N
         C  AND I,M IN BEAM AXES.
         C
ISN 0389        VJ(1) = AIJTAJ(1)*UMODJ+AIJTAJ(4)*VMODJ+AIJTAJ(7)*WMODJ
ISN 0390        VJ(2) = AIJTAJ(2)*UMODJ+AIJTAJ(5)*VMODJ+AIJTAJ(8)*WMODJ
ISN 0391        VJ(3) = AIJTAJ(3)*UMODJ+AIJTAJ(6)*VMODJ+AIJTAJ(9)*WMODJ
ISN 0392        VJ(4) = AIJTAJ(1)*PJ+AIJTAJ(4)*QJ+AIJTAJ(7)*RJ
ISN 0393        VJ(5) = AIJTAJ(2)*PJ+AIJTAJ(5)*QJ+AIJTAJ(8)*RJ
ISN 0394        VJ(6) = AIJTAJ(3)*PJ+AIJTAJ(6)*QJ+AIJTAJ(9)*RJ
ISN 0395        VI(1) = AIJTAI(1)*UMODI+AIJTAI(4)*VMODI+AIJTAI(7)*WMODI
ISN 0396        VI(2) = AIJTAI(2)*UMODI+AIJTAI(5)*VMODI+AIJTAI(8)*WMODI
ISN 0397        VI(3) = AIJTAI(3)*UMODI+AIJTAI(6)*VMODI+AIJTAI(9)*WMODI
ISN 0398        VI(4) = AIJTAI(1)*PI+AIJTAI(4)*QI+AIJTAI(7)*RI
ISN 0399        VI(5) = AIJTAI(2)*PI+AIJTAI(5)*QI+AIJTAI(8)*RI
ISN 0400        VI(6) = AIJTAI(3)*PI+AIJTAI(6)*QI+AIJTAI(9)*RI
ISN 0401        DJ(1) = AIJ(1)*DXMODJ + AIJ(2)*DYMODJ + AIJ(3)*DZMODJ
ISN 0402        DJ(2) = AIJ(4)*DXMODJ + AIJ(5)*DYMODJ + AIJ(6)*DZMODJ
ISN 0403        DJ(3) = AIJ(7)*DXMODJ + AIJ(8)*DYMODJ + AIJ(9)*DZMODJ
ISN 0404        DI(1) = AIJ(1)*DXMODI + AIJ(2)*DYMODI + AIJ(3)*DZMODI
ISN 0405        DI(2) = AIJ(4)*DXMODI + AIJ(5)*DYMODI + AIJ(6)*DZMODI
ISN 0406        DI(3) = AIJ(7)*DXMODI + AIJ(8)*DYMODI + AIJ(9)*DZMODI
ISN 0407        DJ(4) = AIJTAJ(1)*DPIN(J)+AIJTAJ(4)*DQIN(J)+AIJTAJ(7)*DRIN(J)
ISN 0408        DJ(5) = AIJTAJ(2)*DPIN(J)+AIJTAJ(5)*DQIN(J)+AIJTAJ(8)*DRIN(J)
ISN 0409        DJ(6) = AIJTAJ(3)*DPIN(J)+AIJTAJ(6)*DQIN(J)+AIJTAJ(9)*DRIN(J)
ISN 0410        DI(4) = AIJTAI(1)*DPIN(I)+AIJTAI(4)*DQIN(I)+AIJTAI(7)*DRIN(I)
ISN 0411        DI(5) = AIJTAI(2)*DPIN(I)+AIJTAI(5)*DQIN(I)+AIJTAI(8)*DRIN(I)
ISN 0412        DI(6) = AIJTAI(3)*DPIN(I)+AIJTAI(6)*DQIN(I)+AIJTAI(9)*DRIN(I)
         C
```

```
                C  CALCULATE VELOCITIES AND RELATIVE INCREMENTAL DEFLECTIONS (J-I) AND
                C  SUMS (J+I) FOR INTERNAL FORCE CALCULATIONS.  VEEN(1 AND 2) ARE
                C  USED FOR OUTPUT ONLY.
                C
ISN 0413              DO 6100 J2=1,9
ISN 0414              IF(J2.GT.6) GO TO 6110
ISN 0416              D(J2) = DJ(J2) - DI(J2)
ISN 0417              VEL(J2) = VJ(J2) - VI(J2)
ISN 0418              GO TO 6100
ISN 0419         6110 D(J2) = DJ(J2-3) + DI(J2-3)
ISN 0420              IF(J2.NE.7) VEEN(J2-7,IJ) = VEEN(J2-7,IJ)+D(J2)
ISN 0422              VEL(J2) = VJ(J2-3) + VI(J2-3)
ISN 0423         6100 CONTINUE
ISN 0424              DPHIIJ(IJ) = D(7)/2.
                C
                C     MARCH 1977 INTERNAL FORCE CODING
                C
ISN 0425              DO 150 K = 1,6
ISN 0426              IJK = IJK+1
                C
                C     NOW LETS GET A KR IF A TABLE EXISTS
                C     FIRST DETERMINE WHICH TABLE WE WANT
                C
ISN 0427              ITN = NLSFLG(IJK)
ISN 0428              IF(ITN.EQ.0) GO TO 144
ISN 0430              IF(K.EQ.1.OR.K.EQ.4) GO TO 191
ISN 0432              IF(K.EQ.2.OR.K.EQ.6) GO TO 192
ISN 0434              IF(KFL35(IJ).EQ.0) GO TO 191
ISN 0436              KPR = KFL35(IJ)
ISN 0437              GO TO 193
ISN 0438          192 IF(KFL26(IJ).EQ.0) GO TO 191
ISN 0440              KPR = KFL26(IJ)
ISN 0441              GO TO 193
ISN 0442          191 KPR = K
                C
                C     KPR IS THE TABLE NUMBER (1-6) FOR CURRENT IJK
                C
ISN 0443          193 MYSUB = IJK-K+KPR
ISN 0444              ITN = NLSFLG(MYSUB)
ISN 0445              IF(K.NE.1.OR.IJUB(IJ).EQ.0) GO TO 200
ISN 0447              AXK=ABS(VEE(MYSUB))-DB(IJ)
ISN 0448              IF(AXK.LT.0.) AXK=0.
ISN 0450              IF((VEE(MYSUB).LT.0.AND.IJUB(IJ).GT.0).OR.
                     1   (VEE(MYSUB).GT.0.AND.IJUB(IJ).LT.0)) AXK=0.
ISN 0452              GO TO 201
ISN 0453          200 AXK = ABS(VEE(MYSUB))
ISN 0454          201 PTR = CHUG(ITN)
ISN 0455              IF(AXK.LT.XKR(PTR)) GO TO 110
ISN 0457              IF(AXK.GT.XKR(PTR+1)) GO TO 120
ISN 0459          140 KR(K) = XKS(PTR)*AXK+XKI(PTR)
                C
                C     CALCULATE STUFF FOR YIELDING AND RUPTURE SUMMARY TABLES,
                C     (YIELDING ONLY HERE).
```

```
                C
ISN 0460              IF(KRFLAG(IJK).NE.0) GO TO 141
ISN 0462              IF(KR(K).EQ.1.) GO TO 141
ISN 0464              KRCONT = KRCONT+1
ISN 0465              TKR(KRCONT) = TIME
ISN 0466              KRBEAM(1,KRCONT) = IJ
ISN 0467              KRBEAM(2,KRCONT) = K
ISN 0468              KRFLAG(IJK) = 1
ISN 0469              GO TO 141
                C*****CHUG DOWN
ISN 0470          110 PTR = PTR-1
ISN 0471              IF(AXK.LT.XKR(PTR)) GO TO 110
ISN 0473          130 CHUG(ITN) = PTR
ISN 0474              GO TO 140
                C*****CHUG UP
ISN 0475          120 PTR = PTR+1
ISN 0476              IF(AXK.GT.XKR(PTR+1)) GO TO 120
ISN 0478              GO TO 130
ISN 0479          144 KR(K) = 1
ISN 0480              GO TO 150
                C
                C     AFTER ALL THIS CHUGGING,140 CALCULATES KR.
                C     NOTE THAT 130 SAVED LOCATION IN TABLE NO. ITN FOR THE
                C     STARTING POINT AT THE NEXT TIME CUT.
                C
ISN 0481          141 IF(K.EQ.1.OR.K.EQ.4) GO TO 150
ISN 0483              IF(K.EQ.2.OR.K.EQ.6) GO TO 142
ISN 0485              IF(KR(K).NE.1.AND.KFL35(IJ).EQ.0) KFL35(IJ) = K
ISN 0487              GO TO 150
ISN 0488          142 IF(KR(K).NE.1.AND.KFL26(IJ).EQ.0) KFL26(IJ) = K
                C
                C     THIS LOOP SETS KFL35 TO EITHER 3 OR 5,WHICHEVER KR TABLE
                C     GOES NONLINEAR FIRST. FROM THEN ON,KR WILL BE READ FROM
                C     THAT TABLE WHETHER K=3 OR 5. THE SAME GOES FOR KFL26.
                C
ISN 0490          150 CONTINUE
                C
                C SET KR=1. FOR UNLOADING AND RELOADING.
                C
ISN 0491              IJL = 6*(IJ-1)
ISN 0492              DO 7000 L = 1,6
ISN 0493              IJL = IJL + 1
ISN 0494              A = D(L)
                C
                C     CORRECT Y AND Z DEFLECTIONS BY REMOVING ROTATION COMPONENT.
                C     SEE ALSO LABEL 632.
                C
ISN 0495              IF(L.EQ.2) A=A-XXLB*D(9)/2.
ISN 0497              IF(L.EQ.3) A=A+XXLB*D(8)/2.
ISN 0499              B = A + VEE(IJL)
ISN 0500              IF(A.GE.0.0.AND.B.GE.0.0.OR.A.LT.0.0.AND.B.LT.0.0) GO TO 7010
                C
                C     SIGNS ARE NOT THE SAME (UNLOADING)
```

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                 C                                                                      00006240
ISN 0502               IF(NI(IJL).NE.0) GO TO 7020                                      00006250
ISN 0504               NI(IJL) = 1                                                      00006260
ISN 0505               VEEBAR(IJL) = ABS(VEE(IJL))                                      00006270
ISN 0506               GO TO 7020                                                       00006280
ISN 0507          7010 IF(ABS(VEE(IJL)).LT.VEEBAR(IJL)) GO TO 7020                      00006290
                 C                                                                      00006300
                 C  LOADING PATH, USE KR FROM ABOVE.                                    00006310
                 C                                                                      00006320
ISN 0509               NI(IJL) = 0                                                      00006330
ISN 0510               GO TO 7000                                                       00006340
ISN 0511          7020 KR(L) = 1.                                                       00006350
ISN 0512          7000 CONTINUE                                                         00006360
ISN 0513               IF(KR(5).NE.KR(3)) KR(5) = KR(3)                                 00006370
ISN 0515               IF(KR(6).NE.KR(2)) KR(6) = KR(2)                                 00006380
                 C                                                                      00006390
                 C LETS GET THE STIFFNESSES.                                            00006400
                 C                                                                      00006410
ISN 0517               ISTART = 36*(IJ-1)                                               00006420
ISN 0518               XK11 = XK(ISTART +  1)                                           00006430
ISN 0519               XK22 = XK(ISTART +  8)                                           00006440
ISN 0520               XK26 = XK(ISTART + 12)                                           00006450
ISN 0521               XK33 = XK(ISTART + 15)                                           00006460
ISN 0522               XK35 = XK(ISTART + 17)                                           00006470
ISN 0523               XK44 = XK(ISTART + 22)                                           00006480
ISN 0524               XK55 = XK(ISTART + 29)                                           00006490
ISN 0525               XK66 = XK(ISTART + 36)                                           00006500
                 C                                                                      00006510
                 C  CORRECT STIFFNESSES FOR CURRENT BEAM LENGTH.                        00006520
                 C  XXLB IS CURRENT LENGTH, XLB(IJ) IS ORIGINAL LENGTH.                 00006530
                 C                                                                      00006540
ISN 0526               XLRAT1 = XLB(IJ)/XXLB                                            00006550
ISN 0527               XLRAT2 = XLRAT1*XLRAT1                                           00006560
ISN 0528               XLRAT3 = XLRAT1*XLRAT2                                           00006570
ISN 0529               XK11SR=XK11                                                      00006580
ISN 0530               XK44SR=XK44                                                      00006590
ISN 0531               XK55SR=XK55                                                      00006600
ISN 0532               XK66SR=XK66                                                      00006610
ISN 0533               XK22SR=XK22                                                      00006620
ISN 0534               XK33SR=XK33                                                      00006630
ISN 0535               XK26SR=XK26                                                      00006640
ISN 0536               XK35SR=XK35                                                      00006650
ISN 0537               IF(NOLEO.EQ.0) GO TO 4080                                        00006660
ISN 0539               DO 4081 JJ=1,NOLEO                                               00006670
ISN 0540               IF(IGOLEO(JJ).EQ.IG(IJ).AND. JGOLEO(JJ).EQ.JG(IJ).AND.MGOLEO(JJ) 00006680
                      1 .EQ.MG(IJ).AND.NGOLEO(JJ).EQ.NG(IJ)) GO TO 4083                 00006690
ISN 0542          4081 CONTINUE                                                         00006700
ISN 0543               GO TO 4080                                                       00006710
ISN 0544          4083 XK55SR=XK55*SQRT(XLRAT1)                                         00006720
ISN 0545               XK66SR=XK66*SQRT(XLRAT1)                                         00006730
ISN 0546               XK22SR=XK22*SQRT(XLRAT3)                                         00006740
ISN 0547               XK33SR=XK33*SQRT(XLRAT3)                                         00006750
ISN 0548               XK26SR=XK26*SQRT(XLRAT2)                                         00006760
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ISN 0549          XK35SR=XK35*SQRT(XLRAT2)                                    00006770
ISN 0550          XK55=XK55*XLRAT1                                            00006780
ISN 0551          XK66=XK66*XLRAT1                                            00006790
ISN 0552          XK22=XK22*XLRAT3                                            00006800
ISN 0553          XK33=XK33*XLRAT3                                            00006810
ISN 0554          XK26=XK26*XLRAT2                                            00006820
ISN 0555          XK35=XK35*XLRAT2                                            00006830
ISN 0556     4080 CONTINUE                                                    00006840
            C                                                                 00006850
            C  CALCULATE INCREMENTAL STRAIN FORCES DFJ AND DAMPING FORCES FDJ 00006860
            C  AT J,N IN BEAM AXES.                                           00006870
            C                                                                 00006880
ISN 0557          DFJ(1) = XK11*D(1)                                          00006890
ISN 0558          FDJ(1) = XK11SR*VEL(1)                                      00006900
ISN 0559          IF(IJUB(IJ).EQ.0) GO TO 202                                 00006910
ISN 0561          FDJ(1) = 0.                                                 00006920
ISN 0562          IJ1 = 6*(IJ-1)+1                                            00006930
ISN 0563          IF(ABS(VEE(IJ1)+D(1)).GE.DB(IJ)) GO TO 202                  00006940
ISN 0565          DFJ(1) = 0.                                                 00006950
ISN 0566      202 DFJ(4) = XK44*D(4)                                          00006960
ISN 0567          FDJ(4) = XK44SR*VEL(4)                                      00006970
            C                                                                 00006980
            C  CALCULATE 2,6 LOADS.                                           00006990
            C                                                                 00007000
ISN 0568          IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 204                  00007010
ISN 0570          IJPIN=0                                                     00007020
ISN 0571          IF(PZ(IJ).NE.0.AND.ABS(SUMDFI(6,IJ)).GE.PLM26(IJ)) GO TO 810 00007030
ISN 0573          IF(PZJ(IJ).NE.0.AND.ABS(SUMDF(6,IJ)).GE.PLM26J(IJ)) GO TO 812 00007040
ISN 0575          GO TO 204                                                   00007050
ISN 0576      810 IF(PLM26(IJ).EQ.0.OR.FL26I(IJ).NE.0) GO TO 814              00007060
            C                                                                 00007070
            C      FIRST TIME THRU FOR PLASTIC HINGE FORMATION SAVE DATA      00007080
            C       FOR SUMMARY TABLE. I END OF BEAM,6 DIRECTION              00007090
            C                                                                 00007100
ISN 0578          FL26I(IJ)=1                                                 00007110
ISN 0579          KPL=KPL+1                                                   00007120
ISN 0580          TPL(KPL)=TIME                                               00007130
ISN 0581          BPL(KPL,1)=IJ                                               00007140
ISN 0582          BPL(KPL,2)=6                                                00007150
ISN 0583          IF(SUMDFI(6,IJ).LT.0.) BPL(KPL,2)=-6                        00007160
ISN 0585          BPL(KPL,3)=IG(IJ)                                           00007170
ISN 0586      814 IF(PZJ(IJ).NE.0.AND.ABS(SUMDF(6,IJ)).GE.PLM26J(IJ)) GO TO 816 00007180
ISN 0588          GO TO 208                                                   00007190
ISN 0589      816 IJPIN=1                                                     00007200
ISN 0590      812 IF(PLM26J(IJ).EQ.0.OR.FL26J(IJ).NE.0) GO TO 818             00007210
            C                                                                 00007220
            C      FIRST TIME THRU FOR PLASTIC HINGE FORMATION.               00007230
            C       SAVE DATA FOR SUMMARY TABLE. J END OF BEAM,6 DIRECTION    00007240
            C                                                                 00007250
ISN 0592          FL26J(IJ)=1                                                 00007260
ISN 0593          KPL=KPL+1                                                   00007270
ISN 0594          TPL(KPL)=TIME                                               00007280
ISN 0595          BPL(KPL,1)=IJ                                               00007290
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ISN 0596          BPL(KPL,2)=6
ISN 0597          IF(SUMDF(6,IJ).LT.0.) BPL(KPL,2)=-6
ISN 0599          BPL(KPL,3)=JG(IJ)
ISN 0600      818 IF(IJPIN.EQ.1) GC TO 206
            C
            C  PINNED AT J ONLY.
            C
ISN 0602          DFJ(2) = XK22/4*D(2)+XK26/2*DI(6)
ISN 0603          FDJ(2) = XK22SR/4*VEL(2)+XK26SR/2*VI(6)
ISN 0604          DFJ(6) = 0.
ISN 0605          FDJ(6) = 0.
ISN 0606          GO TO 210
            C
            C  PINNED AT I ONLY.
            C
ISN 0607      208 DFJ(2) = XK22/4*D(2) + XK26/2*DJ(6)
ISN 0608          FDJ(2) = XK22SR/4*VEL(2) + XK26SR/2*VJ(6)
ISN 0609          DFJ(6) = XK26/2*D(2) + XK66*3/4*DJ(6)
ISN 0610          FDJ(6) = XK26SR/2*VEL(2) + XK66SR*3/4*VJ(6)
ISN 0611          GO TO 210
            C
            C  PINNED AT I AND J.
            C
ISN 0612      206 DFJ(2) = 0.
ISN 0613          FDJ(2) = 0.
ISN 0614          DFJ(6) = 0.
ISN 0615          FDJ(6) = 0.
ISN 0616          GO TO 210
            C
            C  FIXED AT I AND J.  (NORMAL CASE)
            C
ISN 0617      204 DFJ(2) = XK22*D(2) + XK26*D(9)
ISN 0618          FDJ(2) = XK22SR*VEL(2) + XK26SR*VEL(9)
ISN 0619          DFJ(6) = XK66*(D(6)+3.*D(9))/4. + XK26*D(2)
ISN 0620          FDJ(6) = XK66SR*(VEL(6)+3.*VEL(9))/4. + XK26SR*VEL(2)
            C
            C  CALCULATE 3,5 LOADS.
            C
ISN 0621      210 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 214
ISN 0623          IJPIN=0
ISN 0624          IF(PY(IJ).NE.0.AND.ABS(SUMDFI(5,IJ)).GE.PLM35(IJ)) GO TO 820
ISN 0626          IF(PYJ(IJ).NE.0.AND.ABS(SUMDF(5,IJ)).GE.PLM35J(IJ)) GO TO 822
ISN 0628          GO TO 214
ISN 0629      820 IF(PLM35(IJ).EQ.0.OR.FL35I(IJ).NE.0) GO TO 824
            C
            C     FIRST TIME THRU FOR PLASTIC HINGE FORMATION.SAVE DATA
            C     FOR SUMMARY TABLE. I END OF BEAM,5 DIRECTION
            C
ISN 0631          FL35I(IJ)=1
ISN 0632          KPL=KPL+1
ISN 0633          TPL(KPL)=TIME
ISN 0634          BPL(KPL,1)=IJ
ISN 0635          BPL(KPL,2)=5
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ISN 0636          IF(SUMDFI(5,IJ).LT.0.) BPL(KPL,2)=-5                         00007830
ISN 0638          BPL(KPL,3)=IG(IJ)                                            00007840
ISN 0639      824 IF(PYJ(IJ).NE.0.AND.ABS(SUMDF(5,IJ)).GE.PLM35J(IJ)) GO TO 826  00007850
ISN 0641          GO TO 218                                                    00007860
ISN 0642      826 IJPIN=1                                                      00007870
ISN 0643      822 IF(PLM35J(IJ).EQ.0.OR.FL35J(IJ).NE.0) GO TO 828              00007880
             C                                                                 00007890
             C    FIRST TIME THRU FOR PLASTIC HINGE FORMATION.                 00007900
             C    SAVE DATA FOR SUMMARY TABLE. J END OF BEAM,5 DIRECTION       00007910
             C                                                                 00007920
ISN 0645          FL35J(IJ)=1                                                  00007930
ISN 0646          KPL=KPL+1                                                    00007940
ISN 0647          TPL(KPL)=TIME                                                00007950
ISN 0648          BPL(KPL,1)=IJ                                                00007960
ISN 0649          BPL(KPL,2)=5                                                 00007970
ISN 0650          IF(SUMDF(5,IJ).LT.0) BPL(KPL,2)=-5                           00007980
ISN 0652          BPL(KPL,3)=JG(IJ)                                            00007990
ISN 0653      828 IF(IJPIN.EQ.1) GO TO 216                                     00008000
             C                                                                 00008010
             C  PINNED AT J ONLY.                                              00008020
             C                                                                 00008030
ISN 0655          DFJ(3) = XK33/4*D(3)+XK35/2*DI(5)                            00008040
ISN 0656          FDJ(3) = XK33SR/4*VEL(3)+XK35SR/2*VI(5)                      00008050
ISN 0657          DFJ(5) = 0.                                                  00008060
ISN 0658          FDJ(5) = 0.                                                  00008070
ISN 0659          GO TO 220                                                    00008080
             C                                                                 00008090
             C  PINNED AT I ONLY.                                              00008100
             C                                                                 00008110
ISN 0660      218 DFJ(3) = XK33/4*D(3) + XK35/2*DJ(5)                          00008120
ISN 0661          FDJ(3) = XK33SR/4*VEL(3) + XK35SR/2*VJ(5)                    00008130
ISN 0662          DFJ(5) = XK35/2*D(3) + XK55*3/4*DJ(5)                        00008140
ISN 0663          FDJ(5) = XK35SR/2*VEL(3) + XK55SR*3/4*VJ(5)                  00008150
ISN 0664          GO TO 220                                                    00008160
             C                                                                 00008170
             C  PINNED AT I AND J.                                             00008180
             C                                                                 00008190
ISN 0665      216 DFJ(3) = 0.                                                  00008200
ISN 0666          FDJ(3) = 0.                                                  00008210
ISN 0667          DFJ(5) = 0.                                                  00008220
ISN 0668          FDJ(5) = 0.                                                  00008230
ISN 0669          GO TO 220                                                    00008240
             C                                                                 00008250
             C  FIXED AT I AND J.  (NORMAL CASE)                               00008260
             C                                                                 00008270
ISN 0670      214 DFJ(3) = XK33*D(3) + XK35*D(8)                               00008280
ISN 0671          FDJ(3) = XK33SR*VEL(3) + XK35SR*VEL(8)                       00008290
ISN 0672          DFJ(5) = XK55*(D(5)+3.*D(8))/4. + XK35*D(3)                  00008300
ISN 0673          FDJ(5) = XK55SR*(VEL(5)+3.*VEL(8))/4. + XK35SR*VEL(3)        00008310
             C                                                                 00008320
             C  MULTIPLY DFJ'S BY KR'S.                                        00008330
             C                                                                 00008340
ISN 0674      220 DO 7030 J2=1,6                                               00008350
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ISN 0675          DFJ(J2) = KR(J2)*DFJ(J2)                                  00008360
ISN 0676     7030 CONTINUE                                                  00008370
            C                                                               00008380
            C  MULTIPLY FDJ'S BY DAMPING CONSTANTS.                         00008390
            C                                                               00008400
ISN 0677      222 DO 6130 J2=1,6                                            00008410
ISN 0678          IF(J2.EQ.1.OR.J2.EQ.4) GO TO 6132                         00008420
ISN 0680          IF(J2.EQ.2.OR.J2.EQ.6) GO TO 6134                         00008430
ISN 0682          CON = 0.5*(C(3,IJ)+C(5,IJ))                               00008440
ISN 0683          GO TO 6136                                                00008450
ISN 0684     6134 CON = 0.5*(C(2,IJ)+C(6,IJ))                               00008460
ISN 0685     6136 FDJ(J2) = CON*FDJ(J2)                                     00008470
ISN 0686          FDJ(J2)=KR(J2)*FDJ(J2)                                    00008480
ISN 0687          GO TO 6130                                                00008490
ISN 0688     6132 FDJ(J2) = C(J2,IJ)*FDJ(J2)                                00008500
ISN 0689          FDJ(J2)=KR(J2)*FDJ(J2)                                    00008510
ISN 0690     6130 CONTINUE                                                  00008520
            C                                                               00008530
            C  CALCULATE INCREMENTAL FORCES AT I,M USING                    00008540
            C  STATIC BALANCE EQUATIONS.  DAMPING FORCES ARE TOTAL.         00008550
            C                                                               00008560
ISN 0691          DO 6120 J2=1,6                                            00008570
ISN 0692          DFI(J2) = -DFJ(J2)                                        00008580
ISN 0693          FDI(J2) = -FDJ(J2)                                        00008590
ISN 0694     6120 CONTINUE                                                  00008600
ISN 0695          DFI(5) = DFI(5) + XXLB*DFJ(3)                             00008610
ISN 0696          DFI(6) = DFI(6) - XXLB*DFJ(2)                             00008620
ISN 0697          FDI(5) = FDI(5) + XXLB*FDJ(3)                             00008630
ISN 0698          FDI(6) = FDI(6) - XXLB*FDJ(2)                             00008640
            C                                                               00008650
            C  NOW SUM OVER TIME TO GET CURRENT TOTAL                        00008660
            C  FORCES AT I,M AND J,N.  STILL IN BEAM AXES.                  00008670
            C                                                               00008680
ISN 0699          IJK1 = 6*(IJ-1) + 1                                       00008690
ISN 0700          DO 630 K=1,6                                              00008700
            C                                                               00008710
            C  CHECK FOR UNSYMMETRICAL BEAMS.                               00008720
            C                                                               00008730
ISN 0701          IF(K.NE.1.OR.IJUB(IJ).EQ.0) GO TO 602                     00008740
ISN 0703          IF(TIME.EQ.0.) FUB(IJ) = 0.                               00008750
ISN 0705          FUB(IJ) = FUB(IJ) + DFJ(K)                                00008760
            C                                                               00008770
            C  FUB(IJ) IS THE TOTAL AXIAL LOAD FOR UNSYMMETRICAL BEAMS      00008780
            C  WITHOUT ANY RESTRICTIONS ON + OR -.  NOW ZERO OUT SUMDF      00008790
            C  IF REQUIRED. SUMDF IS USED IN SUBSEQUENT CALC'S AND PRINT.   00008800
            C                                                               00008810
ISN 0706          A = D(K)                                                  00008820
ISN 0707          B = VEE(IJK1) + A                                         00008830
ISN 0708          IF((B.LT.0.AND.IJUB(IJ).GT.0).OR.                         00008840
                 1   (B.GT.0.AND.IJUB(IJ).LT.0)) GO TO 606                  00008850
ISN 0710          IF((FUB(IJ).LE.0.AND.IJUB(IJ).LT.0).OR.                   00008860
                 1   (FUB(IJ).GE.0.AND.IJUB(IJ).GT.0)) GO TO 604            00008870
ISN 0712      606 SUMDF(K,IJ) = 0.                                          00008880
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ISN 0713          SUMDFI(K,IJ) = 0.
ISN 0714          GO TO 600
ISN 0715      604 SUMDF(K,IJ) = FUB(IJ)
ISN 0716          SUMDFI(K,IJ) = -FUB(IJ)
ISN 0717          GO TO 600
ISN 0718      602 SUMDF(K,IJ) = SUMDF(K,IJ) + DFJ(K)
ISN 0719          SUMDFI(K,IJ) = SUMDFI(K,IJ) + DFI(K)
ISN 0720      600 FSJ(K) = SUMDF(K,IJ)
ISN 0721          FSI(K) = SUMDFI(K,IJ)
ISN 0722          FINT(K,IJ) = FSJ(K) + FDJ(K)
ISN 0723          FINTI(K,IJ) = FSI(K) + FDI(K)
            C
            C      REDO AXIAL LOAD CALCULATIONS FOR LANDING GEAR OLEO MODULES
            C       STRAIN FORCES ARE DUE TO AIR CURVE,DAMPING FORCES ARE DUE
            C       TO HYDRAULIC DAMPING & FRICTION
            C
ISN 0724          IF(NOLEO.EQ.0 .OR.K.NE.1) GO TO 630
ISN 0726          DO 700 JJ=1,NOLEO
ISN 0727           IF(I.EQ.IGOLEO(JJ).AND.J.EQ.JGOLEO(JJ).AND.M.EQ.MGOLEO(JJ)
                1 .AND.N.EQ.NGOLEO(JJ)) GO TO 702
ISN 0729      700 CONTINUE
ISN 0730          GO TO 630
ISN 0731      702 YOLEO(JJ)=YOLEO(JJ)-D(1)
ISN 0732          YDOLEO=-VEL(1)
ISN 0733          FA=FAO(JJ)*(EOLEO(JJ)/(EOLEO(JJ)-YOLEO(JJ)))**EXPOLE(JJ)-FAA(JJ)
ISN 0734          BDAMP=BOLEO(JJ)
ISN 0735          IF(YDOLEO.LT.0) BDAMP=BROLEO(JJ)
ISN 0737          FH=BDAMP*YDOLEO*ABS(YDOLEO)
ISN 0738          ARGU=YDOLEO/ALPHAP
ISN 0739          FC=FCOUL(JJ)*TANH(ARGU)
ISN 0740          FCOMP=(YOLEO(JJ)-YMAX(JJ))*XKCOMP(JJ)
ISN 0741          IF(FCOMP.LT.0.) FCOMP=0.
ISN 0743          FEXT=YOLEO(JJ)*XKEXT(JJ)
ISN 0744          IF(FEXT.GT.0. ) FEXT=0.
ISN 0746          FOLEO=FA+FH+FC+FEXT+FCOMP
ISN 0747          SUMDFI(K,IJ)=FA+FCOMP+FEXT
ISN 0748          SUMDF(K,IJ)=-SUMDFI(K,IJ)
ISN 0749          FSJ(K)=SUMDF(K,IJ)
ISN 0750          FSI(K)=SUMDFI(K,IJ)
ISN 0751          FDI(K)=FH+FC
ISN 0752          FDJ(K)=-FDI(K)
ISN 0753          FINT(K,IJ)=FSJ(K)+FDJ(K)
ISN 0754          FINTI(K,IJ)=FSI(K)+FDI(K)
ISN 0755      630 CONTINUE
            C
            C     STRESS CALCULATIONS
            C
ISN 0756          IF(NSC.EQ.0) GO TO 633
            C
            C     Z1,Z2,XIQ AND SYIELD DATA STORED IN SMALL ARRAYS,REFERENCED BY
            C     NJ,WHICH VARIES FROM 1 TO NS. OTHER DATA STORED IN LARGE ARRAYS
            C     FOR BEAM DATA,REFERENCED BY IJ,WHICH VARIES FROM 1 TO NB.
            C
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                C
                C     DETERMINE MAXIMUM BENDING MOMENTS ABOUT Y AND Z AXES.
                C     THESE COULD OCCUR AT EITHER END OF BEAM (I OR J).
                C     SHEAR FORCES AND AXIAL LOAD AND TORSION ARE CONSTANT ALONG BEAM.
                C
ISN 0758          501 FX = FINT(1,IJ)
ISN 0759              FY = FINT(2,IJ)
ISN 0760              FZ = FINT(3,IJ)
ISN 0761              MX = FINT(4,IJ)
ISN 0762              MYJ = FINT(5,IJ)
ISN 0763              MZJ = FINT(6,IJ)
ISN 0764              MYI = MYJ-XXLB*FZ
ISN 0765              MZI = MZJ+XXLB*FY
ISN 0766              MY = MYJ
ISN 0767              MZ = MZJ
ISN 0768              IF(PCR(IJ).NE.0.) GO TO 510
ISN 0770              SBUCKR(IJ) = 0.
ISN 0771              GO TO 512
ISN 0772          510 SBUCKR(IJ)=FINT(1,IJ)/PCR(IJ)
ISN 0773          512 IF(ABS(MYI).GT.ABS(MYJ)) MY = MYI
ISN 0775              IF(ABS(MZI).GT.ABS(MZJ)) MZ = MZI
                C
                C     CALCULATE AXIAL STRESSES (SX) AND SHEAR STRESSES (SS)
                C     FOR PLANE ELEMENTS LOCATED AT TOP,BOTTOM,RIGHT AND LEFT
                C     SIDES OF BEAM.
                C
                C     IF YY(IJ),ZZ(IJ)=0 SXMY,SXMZ BLOW UP CODE TO BYPASS
ISN 0777              IF (YY(IJ).NE.0.) GO TO 502
ISN 0779              SXMY =0.0
ISN 0780              GO TO 507
ISN 0781          502 SXMY = MY*Z1(IJ)/YY(IJ)
ISN 0782          507 IF(ZZ(IJ).NE.0.) GO TO 503
ISN 0784              SXMZ =0.0
ISN 0785              GO TO 504
ISN 0786          503 SXMZ = MZ*Z2(IJ)/ZZ(IJ)
ISN 0787          504 SSMX = MX*XIQ(IJ)
ISN 0788              IF (AA(IJ).NE.0.0) GO TO 505
ISN 0790              SSFY =0.0
ISN 0791              SSFZ =0.0
ISN 0792              SXFX =0.0
ISN 0793              GO TO 506
ISN 0794          505 SSFY = FY/AA(IJ)*1.5
ISN 0795              SSFZ = FZ/AA(IJ)*1.5
ISN 0796              SXFX = FX/AA(IJ)
                C
                C     TOP (1)
                C
ISN 0797          506 SAX(1) = SXFX-SXMY
ISN 0798              SS(1) = SSMX+SSFY
                C
                C     BOTTOM (2)
                C
ISN 0799              SAX(2) = SXFX+SXMY
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ISN 0800          SS(2) =-SSMX+SSFY
            C
            C     LEFT (3)
            C
ISN 0801          SAX(3) = SXFX+SXMZ
ISN 0802          SS(3) = SSMX-SSFZ
            C
            C     RIGHT (4)
            C
ISN 0803          SAX(4) = SXFX-SXMZ
ISN 0804          SS(4) =-SSMX-SSFZ
            C
            C     NOW,FOR EACH OF THE FOUR LOCATIONS,CALCULATE MAXIMUM SHEAR
            C     STRESS (SSM) AND PRINCIPAL STRESSES (S1,S2). USE THESE TO
            C     FORM RATIOS OF ACTUAL STRESS/FAILURE STRESS FOR TWO FAILURE
            C     CRITERIA.THE TWO CRITERIA USED ARE MAXIMUM SHEAR THEORY AND
            C     THEORY OF CONSTANT ENERGY OF DISTORTION. REFER TO ROARK,P.94,29.
            C
ISN 0805          DO 653 IS=1,4
ISN 0806          SYIELD = STENS(MC(IJ))
ISN 0807          IF(SAX(IS).LT.0.) SYIELD=SCOMP(MC(IJ))
ISN 0809          SSM = SQRT(.25*SAX(IS)*SAX(IS)+SS(IS)*SS(IS))
ISN 0810          S1 = .5*SAX(IS)+SSM
ISN 0811          S2 = .5*SAX(IS)-SSM
ISN 0812          SP = SQRT(S1*S1+S2*S2-S1*S2)
ISN 0813          FRS(IJ,IS) = SSM/SHEAR(MC(IJ))
ISN 0814          FRD(IJ,IS) = SP/SYIELD
ISN 0815      653 CONTINUE
            C*****COMPUTE THE ENERGY HERE BUT ADD IT AFTER 230 (NO RUPTURE)
ISN 0816      633 SUMSEI = 0.0
ISN 0817          SUMDEI = 0.0
ISN 0818          SUMSEJ = 0.0
ISN 0819          SUMDEJ = 0.0
ISN 0820          SUMSE  = 0.0
ISN 0821          SUMDE  = 0.0
            C*****DON'T USE AN IJ IF IT'S A DRI ELEMENT
ISN 0822          IF(IJPR(IJ).NE.0) GO TO 632
ISN 0824          DO 631 K = 1,6
ISN 0825          SUMSEI = SUMSEI + FSI(K)*DI(K)
ISN 0826          SUMDEI = SUMDEI + FDI(K)*DI(K)
ISN 0827          SUMSEJ = SUMSEJ + FSJ(K)*DJ(K)
ISN 0828          SUMDEJ = SUMDEJ + FDJ(K)*DJ(K)
ISN 0829          SUMSE = SUMSEI + SUMSEJ
ISN 0830          SUMDE = SUMDEI + SUMDEJ
ISN 0831      631 CONTINUE
            C
            C  UPDATE DEFLECTIONS AND CHECK FOR RUPTURE.  FIRST CORRECT Y AND Z
            C  DEFLECTIONS BY REMOVING COMPONENTS DUE TO ROTATION OF MASSES.
            C
ISN 0832      632 D(2) = D(2) - XXLB*D(9)/2.
ISN 0833          D(3) = D(3) + XXLB*D(8)/2.
ISN 0834          IJL = 6*(IJ-1)
ISN 0835          DO 230 L = 1,6
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ISN 0836          IJL = IJL+1
ISN 0837          T = VEE(IJL)+D(L)
ISN 0838          TF=FINT(L,IJ)
ISN 0839          FEE(IJL)=TF
ISN 0840          VEE(IJL) = T
ISN 0841          IF(T) 240,250,250
ISN 0842      240 IF(ABS(T)-VMAXN(IJL)) 251,260,260
ISN 0843      250 IF(T-VMAX(IJL)) 251,260,260
ISN 0844      260 IRUPSW(IJ)=1
ISN 0845          IF(T) 252,253,253
ISN 0846      252 PRINT 1040,IJ,L,VEE(IJL),VMAXN(IJL),TIME
ISN 0847          NDIR=-1
ISN 0848     1040 FORMAT(1H1,'NEG.DIRECTION RUPTURE'//1X,'BEAM',2X,'DIRECTION',3X,
                1 'MAGNITUDE',6X,'ALLOWABLE',6X,'TIME'//1X,I5,5X,I5,1P3E15.6)
ISN 0849          GO TO 256
ISN 0850      253 PRINT 1050,IJ,L,VEE(IJL),VMAX(IJL),TIME
ISN 0851          NDIR=1
ISN 0852     1050 FORMAT(1H1,'POS.DIRECTION RUPTURE'//1X,'BEAM',2X,'DIRECTION',3X,
                1 'MAGNITUDE',6X,'ALLOWABLE',6X,'TIME'//1X,I5,5X,I5,1P3E15.6)
ISN 0853          GO TO 256
ISN 0854      251 IF(TF) 274,271,271
ISN 0855      274 IF(ABS(TF)-FMAXN(IJL)) 230,255,255
ISN 0856      271 IF(TF-FMAX(IJL)) 230,255,255
ISN 0857      255 IRUPSW(IJ)=1
ISN 0858          IF(TF) 272,273,273
ISN 0859      272 PRINT 1040,IJ,L,FEE(IJL),FMAXN(IJL),TIME
ISN 0860          NDIR=-1
ISN 0861          GO TO 256
ISN 0862      273 PRINT 1050,IJ,L,FEE(IJL),FMAX(IJL),TIME
ISN 0863          NDIR=1
            C
            C     CALCULATE STUFF FOR YIELDING AND RUPTURE SUMMARY TABLE,
            C     (RUPTURE ONLY HERE).
            C
ISN 0864      256 KRCONT = KRCONT+1
ISN 0865          TKR(KRCONT) = TIME
ISN 0866          KRBEAM(1,KRCONT) = IJ
ISN 0867          KRBEAM(3,KRCONT) = L
ISN 0868          KRBEAM(4,KRCONT)=NDIR
ISN 0869          GO TO 1000
ISN 0870      230 CONTINUE
ISN 0871          SEIJ(IJ) = SEIJ(IJ)+SUMSE
ISN 0872          DEIJ(IJ) = DEIJ(IJ)+SUMDE
            C
            C     SUM OVER BOTH TIME AND BEAMS.
            C
ISN 0873          XSE(I) = XSE(I) + SUMSEI
ISN 0874          XDE(I) = XDE(I) + SUMDEI
ISN 0875          IF(J.NE.81) GO TO 280
            C
            C     FOR TRANSVERSE BEAMS, ADD ENERGY AT J=81 END OF BEAM TO I MASS.
            C
ISN 0877          XSE(I) = XSE(I) + SUMSEJ
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ISN 0878          XDE(I) = XDE(I) + SUMDEJ
ISN 0879          GO TO 282
ISN 0880      280 XSE(J) = XSE(J) + SUMSEJ
ISN 0881          XDE(J) = XDE(J) + SUMDEJ
             C
             C    FOR A SYMMETRICAL MODEL WE MUST ADD SE AND DE CONTRIBUTIONS
             C    FROM THE OPPOSITE BEAMS THAT ARE NOT INPUT EXPLICITLY. WE
             C    DO NOT DO THIS FOR TRANSVERSE BEAMS OR THOSE ON THE
             C    AIRPLANE CL.
             C
ISN 0882      282 IF(SYMFLG.NE.1.OR.J.EQ.81.OR.CLTEST(IJ).EQ.1.) GO TO 238
ISN 0884          SEIJ(IJ) = SEIJ(IJ)+SUMSE
ISN 0885          DEIJ(IJ) = DEIJ(IJ)+SUMDE
ISN 0886          XSE(I) = XSE(I) + SUMSEI
ISN 0887          XSE(J) = XSE(J) + SUMSEJ
ISN 0888          XDE(I) = XDE(I) + SUMDEI
ISN 0889          XDE(J) = XDE(J) + SUMDEJ
ISN 0890      238 IF (IJPR(IJ).NE.0)       DRI(IJ) = -6.55D0*VEE(6*(IJ-1)+1)
             C
             C NOW ADD FSI AND FDI AND CALL IT FSI.  SAME AT J.  WE NO
             C LONGER NEED SEPARATE STRAIN AND DAMPING FORCES.
             C
ISN 0892          DO 270 J2=1,6
ISN 0893          FSI(J2) = FSI(J2) + FDI(J2)
ISN 0894          FSJ(J2) = FSJ(J2) + FDJ(J2)
ISN 0895      270 CONTINUE
             C
             C CONVERT BEAM FORCES TO MASS AXES AND REVERSE SIGNS TO GET
             C FORCES ACTING ON MASSES.  USE TRANSPOSE OF AIJTAJ OR AIJTAI.
             C
ISN 0896          IF (IJPR(IJ).NE.0) GO TO 6210
ISN 0898          T1 = -FSI(1)
ISN 0899          T2 = -FSI(2)
ISN 0900          T3 = -FSI(3)
ISN 0901          FSI(1) = AIJTAI(1)*T1+AIJTAI(2)*T2+AIJTAI(3)*T3
ISN 0902          FSI(2) = AIJTAI(4)*T1+AIJTAI(5)*T2+AIJTAI(6)*T3
ISN 0903          FSI(3) = AIJTAI(7)*T1+AIJTAI(8)*T2+AIJTAI(9)*T3
ISN 0904          T1 = -FSI(4)
ISN 0905          T2 = -FSI(5)
ISN 0906          T3 = -FSI(6)
ISN 0907          FSI(4) = AIJTAI(1)*T1+AIJTAI(2)*T2+AIJTAI(3)*T3
ISN 0908          FSI(5) = AIJTAI(4)*T1+AIJTAI(5)*T2+AIJTAI(6)*T3
ISN 0909          FSI(6) = AIJTAI(7)*T1+AIJTAI(8)*T2+AIJTAI(9)*T3
ISN 0910     6210 IF(J.EQ.81) GO TO 6200
ISN 0912          T1 = -FSJ(1)
ISN 0913          T2 = -FSJ(2)
ISN 0914          T3 = -FSJ(3)
ISN 0915          FSJ(1) = AIJTAJ(1)*T1+AIJTAJ(2)*T2+AIJTAJ(3)*T3
ISN 0916          FSJ(2) = AIJTAJ(4)*T1+AIJTAJ(5)*T2+AIJTAJ(6)*T3
ISN 0917          FSJ(3) = AIJTAJ(7)*T1+AIJTAJ(8)*T2+AIJTAJ(9)*T3
ISN 0918          T1 = -FSJ(4)
ISN 0919          T2 = -FSJ(5)
ISN 0920          T3 = -FSJ(6)
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ISN 0921          FSJ(4) = AIJTAJ(1)*T1+AIJTAJ(2)*T2+AIJTAJ(3)*T3
ISN 0922          FSJ(5) = AIJTAJ(4)*T1+AIJTAJ(5)*T2+AIJTAJ(6)*T3
ISN 0923          FSJ(6) = AIJTAJ(7)*T1+AIJTAJ(8)*T2+AIJTAJ(9)*T3
ISN 0924     6200 CONTINUE
            C
            C     TO GET THE BEAM MOMENTS AT MASS J,WE MUST ACCOUNT FOR THE
            C     MOMENTS DUE TO THE BEAM FORCES AT NODE POINT (J,N), WHICH
            C     IS OFFSET FROM MASS J BY THE VECTOR (RX,RY,RZ). THESE VECTOR
            C     ELEMENTS ARE SUBSCRIPTED BY NODE POINT, FROM 1 TO NNP, AND
            C     ARE IN MASS J AXES.
            C
ISN 0925          IF(N.EQ.0.OR.J.EQ.81) GO TO 3410
            C
            C  MOMENTS AT J, MASS J AXES.
            C
ISN 0927          FSJ(4) = FSJ(4) + FSJ(3)*RY(JJ) - FSJ(2)*RZ(JJ)
ISN 0928          FSJ(5) = FSJ(5) - FSJ(3)*RX(JJ) + FSJ(1)*RZ(JJ)
ISN 0929          FSJ(6) = FSJ(6) + FSJ(2)*RX(JJ) - FSJ(1)*RY(JJ)
ISN 0930     3410 CONTINUE
            C
            C  MOMENTS AT I, MASS I AXES.  SKIP FOR DRI ELEMENTS.
            C
ISN 0931          IF(IJPR(IJ).NE.0) GO TO 264
ISN 0933          IF(M.EQ.0) GO TO 266
ISN 0935          FSI(4) = FSI(4) + FSI(3)*RY(JI) - FSI(2)*RZ(JI)
ISN 0936          FSI(5) = FSI(5) - FSI(3)*RX(JI) + FSI(1)*RZ(JI)
ISN 0937          FSI(6) = FSI(6) + FSI(2)*RX(JI) - FSI(1)*RY(JI)
ISN 0938          GO TO 266
ISN 0939      264 DO 265 JJJ=1,6
ISN 0940          FSI(JJJ) = 0.
ISN 0941      265 CONTINUE
            C
            C     FOR SYMFLG = 1.,WE LATER DOUBLE ALL XZ AND M INTERNAL
            C     AND DAMPING LOADS ACTING ON A MASS ON THE AIRPLANE
            C     PLANE OF SYMMETRY. SINCE WE DO THIS FOR ALL BEAMS,
            C     HERE WE MUST HALVE THE LOADS FOR BEAMS THAT LIE
            C     ENTIRELY IN THE PLANE OF SYMMETRY,SINCE THESE LOADS
            C     SHOULD NOT BE DOUBLED. CLTEST(IJ) IS NE ZERO FOR THIS
            C     CONDITION.
            C
ISN 0942      266 CONTINUE
ISN 0943          IF(SYMFLG.NE.1.OR.CLTEST(IJ).EQ.0.) GO TO 5001
ISN 0945          DO 5002 JJJ=1,6
ISN 0946          FSJ(JJJ) = FSJ(JJJ)/2.
ISN 0947          FSI(JJJ) = FSI(JJJ)/2.
ISN 0948     5002 CONTINUE
            C
            C  NOW SUM FORCES AT MASSES I AND J.  SUMMING OVER BEAMS.
            C
ISN 0949     5001 XX(I) = XX(I) + FSI(1)
ISN 0950          XY(I) = XY(I) + FSI(2)
ISN 0951          XZ(I) = XZ(I) + FSI(3)
ISN 0952          XL(I) = XL(I) + FSI(4)
```

```
ISN 0953          XM(I) = XM(I) + FSI(5)
ISN 0954          XN(I) = XN(I) + FSI(6)
ISN 0955          IF(J.EQ.81) GO TO 1000
ISN 0957          XX(J) = XX(J) + FSJ(1)
ISN 0958          XY(J) = XY(J) + FSJ(2)
ISN 0959          XZ(J) = XZ(J) + FSJ(3)
ISN 0960          XL(J) = XL(J) + FSJ(4)
ISN 0961          XM(J) = XM(J) + FSJ(5)
ISN 0962          XN(J) = XN(J) + FSJ(6)
ISN 0963     1000 CONTINUE
            C
            C     END OF MAIN INTERNAL BEAM IJ LOOP.
            C
ISN 0964          IS=9*(MVP-1)
ISN 0965          DO 1010 KS=1,9
ISN 0966          IS=IS+1
ISN 0967     1010 AP(KS)=BIJ(IS)
            C FINISH COMPUTING DERIVATIVES
            C      SET COUNTER=0 FOR ACCEL PULSE
ISN 0968          NPTSP=0
ISN 0969          NPTS=0
ISN 0970          DO 2000 I = 1,NM
ISN 0971          IS = 9*(I-1)
ISN 0972          DO 330 KS = 1,9
ISN 0973          IS = IS+1
ISN 0974          AIDOT(KS) = CIJ(IS)
ISN 0975      330 AI(KS) = BIJ(IS)
            C DO CRASH FORCES
ISN 0976          DO 460 J1=1,6
ISN 0977          XC(J1) = 0.
ISN 0978      460 CONTINUE
ISN 0979          DO 340 IKM=1,NSP
ISN 0980          IF(I.EQ.II(IKM)) GO TO 400
ISN 0982      340 CONTINUE
ISN 0983          GO TO 440
ISN 0984      400 CALL CFORCE
            C (20),(23),(24)
ISN 0985      440 XA = WGT(I)-ALIFT(I)*WTOT
ISN 0986          SX = XX(I)+XA*AI(3)+XC(1)
ISN 0987          SY = XY(I)+XA*AI(6)+XC(2)
ISN 0988          SZ = XZ(I)+XA*AI(9)+XC(3)
ISN 0989          SL = XL(I)+XC(4)
ISN 0990          SM = XM(I)+XC(5)
ISN 0991          SN = XN(I)+XC(6)
            C
            C     IF WE HAVE A SYMMETRIC CASE (SYMFLG.NE.0) AND THE MASS WE ARE
            C     CONSIDERING IS ON THE AIRPLANE CENTERLINE (YDP(I)=0),THEN WE
            C     MUST CORRECT THE TOTAL FORCES AND MOMENTS TO ACCOUNT FOR THE
            C     BEAMS ON THE OTHER SIDE,NOT CALCULATED,THAT CONNECT TO THIS MASS.
            C
ISN 0992          IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 1011
ISN 0994          SY = 0.
ISN 0995          SL = 0.
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ISN 0996          SN = 0.                                                00012600
ISN 0997          IF(SYMFLG.EQ.2.) GO TO 1011                            00012610
ISN 0999          SX = SX+XX(I)                                          00012620
ISN 1000          SZ = SZ+XZ(I)                                          00012630
ISN 1001          SM = SM+XM(I)                                          00012640
            C GET P,Q,R,U,V,W                                            00012650
ISN 1002     1011 PP = P(I)                                              00012660
ISN 1003          QQ = Q(I)                                              00012670
ISN 1004          RR = R(I)                                              00012680
ISN 1005          UU = U(I)                                              00012690
ISN 1006          VV = V(I)                                              00012700
ISN 1007          WW = W(I)                                              00012710
            C MASS                                                       00012720
ISN 1008          ZM=386.0/WGT(I)                                        00012730
ISN 1009          IF(TIME.NE.0.) GO TO 343                               00012740
ISN 1011          XACF(I) = XACC(I)                                      00012750
ISN 1012          YACF(I) = YACC(I)                                      00012760
ISN 1013          ZACF(I) = ZACC(I)                                      00012770
            C     TEMP CALCS                                             00012780
ISN 1014          XACF(I)=0.                                             00012790
ISN 1015          YACF(I)=0.                                             00012800
ISN 1016          ZACF(I)=0.                                             00012810
            C (25)                                                       00012820
ISN 1017      343 UDOTI = UDOT(I)                                        00012830
ISN 1018          VDOTI = VDOT(I)                                        00012840
ISN 1019          WDOTI = WDOT(I)                                        00012850
ISN 1020          UDOT(I)=SX*ZM-QQ*WW+RR*VV                              00012860
ISN 1021          VDOT(I)=SY*ZM-RR*UU+PP*WW                              00012870
ISN 1022          WDOT(I)=SZ*ZM-PP*VV+QQ*UU                              00012880
ISN 1023          IF(NACC.EQ.0) GO TO 341                                00012890
ISN 1025          CALL ACCELT(I,UDOT(I),VDOT(I),WDOT(I),PDOT(I),QDOT(I),RDOT(I), 00012900
                 1TIME,NPTSP,NPTS)                                       00012910
ISN 1026          NPTSP=NPTS                                             00012920
ISN 1027      341 XACC(I)=(UDOT(I)+QQ*WW-RR*VV)/386.                     00012930
ISN 1028          YACC(I)=(VDOT(I)+RR*UU-PP*WW)/386.                     00012940
ISN 1029          ZACC(I)=(WDOT(I)+PP*VV-QQ*UU)/386.                     00012950
ISN 1030          XACFDI = XACFD(I)                                      00012960
ISN 1031          YACFDI = YACFD(I)                                      00012970
ISN 1032          ZACFDI = ZACFD(I)                                      00012980
ISN 1033          IF(PFIL.EQ.0.) GO TO 344                               00012990
ISN 1035          XACFD(I) = (XACC(I)-XACF(I))/PFIL                      00013000
ISN 1036          YACFD(I) = (YACC(I)-YACF(I))/PFIL                      00013010
ISN 1037          ZACFD(I) = (ZACC(I)-ZACF(I))/PFIL                      00013020
ISN 1038          GO TO 345                                              00013030
ISN 1039      344 XACFD(I) = 0.                                          00013040
ISN 1040          YACFD(I) = 0.                                          00013050
ISN 1041          ZACFD(I) = 0.                                          00013060
            C (26)                                                       00013070
ISN 1042      345 T1 = -XZI(I)*PP-YZI(I)*QQ+ZI(I)*RR+HEZ(I)              00013080
ISN 1043          T2 = XI(I)*PP-XYI(I)*QQ-XZI(I)*RR+HEX(I)               00013090
ISN 1044          T3 = -XYI(I)*PP+YI(I)*QQ-YZI(I)*RR+HEY(I)              00013100
ISN 1045          SL = SL-QQ*T1+RR*T3                                    00013110
ISN 1046          SM = SM-RR*T2+PP*T1                                    00013120
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ISN 1047         SN = SN-PP*T3+QQ*T2                                    00013130
           C (25)                                                       00013140
ISN 1048         DEL = DELI(I)                                          00013150
ISN 1049         PDOTI = PDOT(I)                                        00013160
ISN 1050         PDOT(I) = DEL*(SL*XI1(I)+SM*XI2(I)+SN*XI3(I))          00013170
ISN 1051         QDOTI = QDOT(I)                                        00013180
ISN 1052         QDOT(I) = DEL*(SL*XI2(I)+SM*XI5(I)+SN*XI4(I))          00013190
ISN 1053         RDOTI = RDOT(I)                                        00013200
ISN 1054         RDOT(I) = DEL*(SL*XI3(I)+SM*XI4(I)+SN*XI6(I))          00013210
           C                                                            00013220
           C     FOR A SYMMETRICAL CASE,CONSTRAIN THE ACCELERATIONS OF THE  00013230
           C     CENTERLINE MASSES.                                     00013240
           C                                                            00013250
ISN 1055         IF(SYMFLG.EQ.0.OR.YDP(I).NE.0.) GO TO 342              00013260
ISN 1057         VDOT(I) = 0.                                           00013270
ISN 1058         PDOT(I) = 0.                                           00013280
ISN 1059         RDOT(I) = 0.                                           00013290
ISN 1060     342 XDOTI = XDOT(I)                                        00013300
ISN 1061         YDOTI = YDOT(I)                                        00013310
ISN 1062         ZDOTI = ZDOT(I)                                        00013320
ISN 1063         PHDOTI = PHIDOT(I)                                     00013330
ISN 1064         THDOTI = THEDOT(I)                                     00013340
ISN 1065         PSDOTI = PSIDOT(I)                                     00013350
ISN 1066         IF(TIME) 1900,1900,300                                 00013360
           C                                                            00013370
           C     ...VARIABLE INTEGRATION ADDED  11/09/77  DHS...        00013380
           C                                                            00013390
ISN 1067     300 UP = U(I)                                              00013400
ISN 1068         U(I) = TT*U(I)+ET*(UOLD(I)+DTHALF*(UDOT(I)+UDOTI))     00013410
ISN 1069         ERR = AMAX1(ERR,                                       00013420
                1(ABS(UDOT(I)-UDOTI)*DELTAT)/                           00013430
                2        AMAX1(ABS(UOLD(I))+ABS(U(I)-UOLD(I)),1.D-06))  00013440
           C                                                            00013450
           C                                                            00013460
ISN 1070         VP = V(I)                                              00013470
ISN 1071         V(I) = TT*V(I)+ET*(VOLD(I)+DTHALF*(VDOT(I)+VDOTI))     00013480
ISN 1072         ERR = AMAX1(ERR,                                       00013490
                1(ABS(VDOT(I)-VDOTI)*DELTAT)/                           00013500
                2        AMAX1(ABS(VOLD(I))+ABS(V(I)-VOLD(I)),1.D-06))  00013510
           C                                                            00013520
           C                                                            00013530
ISN 1073         WP = W(I)                                              00013540
ISN 1074         W(I) = TT*W(I)+ET*(WOLD(I)+DTHALF*(WDOT(I)+WDOTI))     00013550
ISN 1075         ERR = AMAX1(ERR,                                       00013560
                1(ABS(WDOT(I)-WDOTI)*DELTAT)/                           00013570
                2        AMAX1(ABS(WOLD(I))+ABS(W(I)-WOLD(I)),1.D-06))  00013580
           C                                                            00013590
           C                                                            00013600
ISN 1076         PP = P(I)                                              00013610
ISN 1077         P(I) = TT*P(I)+ET*(POLD(I)+DTHALF*(PDOT(I)+PDOTI))     00013620
ISN 1078         ERR = AMAX1(ERR,                                       00013630
                1(ABS(PDOT(I)-PDOTI)*DELTAT)/                           00013640
                2        AMAX1(ABS(POLD(I))+ABS(P(I)-POLD(I)),1.D-06))  00013650
```

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                C
                C
ISN 1079           QP = Q(I)
ISN 1080           Q(I) = TT*Q(I)+ET*(QOLD(I)+DTHALF*(QDOT(I)+QDOTI))
ISN 1081           ERR = AMAX1(ERR,
                  1(ABS(QDOT(I)-QDOTI)*DELTAT)/
                  2        AMAX1(ABS(QOLD(I))+ABS(Q(I)-QOLD(I)),1.D-06))
                C
                C
ISN 1082           RP = R(I)
ISN 1083           R(I) = TT*R(I)+ET*(ROLD(I)+DTHALF*(RDOT(I)+RDOTI))
ISN 1084           ERR = AMAX1(ERR,
                  1(ABS(RDOT(I)-RDOTI)*DELTAT)/
                  2        AMAX1(ABS(ROLD(I))+ABS(R(I)-ROLD(I)),1.D-06))
                C
                C  CHANGE ERR DEFINITION FOR ENERGY BASED VARIABLE DT SCHEME.
                C
ISN 1085           IF(IVAR.EQ.2) ERR=DEVMAX*TMAX/TIME
ISN 1087           X(I) = TT*X(I)+ET*(XOLD(I)+DTHALF*(XDOT(I)+XDOTI))
ISN 1088           Y(I) = TT*Y(I)+ET*(YOLD(I)+DTHALF*(YDOT(I)+YDOTI))
ISN 1089           Z(I) = TT*Z(I)+ET*(ZOLD(I)+DTHALF*(ZDOT(I)+ZDOTI))
ISN 1090           PHI(I) = TT*PHI(I)+ET*(PHIOLD(I)+DTHALF*(PHIDOT(I)+PHDOTI))
ISN 1091           THETA(I) = TT*THETA(I)+ET*(THEOLD(I)+DTHALF*(THEDOT(I)+THDOTI))
ISN 1092           PSI(I) = TT*PSI(I)+ET*(PSIOLD(I)+DTHALF*(PSIDOT(I)+PSDOTI))
ISN 1093           PIN(I) = TT*PIN(I)+ET*(PINO(I)+DTHALF*(P(I)+POLD(I)))
ISN 1094           QIN(I) = TT*QIN(I)+ET*(QINO(I)+DTHALF*(Q(I)+QOLD(I)))
ISN 1095           RIN(I) = TT*RIN(I)+ET*(RINO(I)+DTHALF*(R(I)+ROLD(I)))
                C
                C  XACI ETC ARE MASS IMPULSE CALCS 2-5-79
                C
ISN 1096           XACI=XACF(I)
ISN 1097           YACI=YACF(I)
ISN 1098           ZACI=ZACF(I)
ISN 1099           XACF(I) = TT*XACF(I)+ET*(XAFOLD(I)+DTHALF*(XACFD(I)+XACFDI))
ISN 1100           YACF(I) = TT*YACF(I)+ET*(YAFOLD(I)+DTHALF*(YACFD(I)+YACFDI))
ISN 1101           ZACF(I) = TT*ZACF(I)+ET*(ZAFOLD(I)+DTHALF*(ZACFD(I)+ZACFDI))
ISN 1102           XIMP(I)=TT*XIMP(I)+ET*(XIMPOL(I)+DTHALF*(XACF(I)+XACI))
ISN 1103           YIMP(I)=TT*YIMP(I)+ET*(YIMPOL(I)+DTHALF*(YACF(I)+YACI))
ISN 1104           ZIMP(I)=TT*ZIMP(I)+ET*(ZIMPOL(I)+DTHALF*(ZACF(I)+ZACI))
ISN 1105           IF ((IPENSW(I).NE.0).OR.(I.EQ.MVP).OR.(MVP.EQ.0)) GO TO 1900
                C
                C     CONTROL VOLUME PENETRATION CALCULATIONS
                C
ISN 1107           TP1=X(I)-X(MVP)
ISN 1108           TP2=Y(I)-Y(MVP)
ISN 1109           TP3=Z(I)-Z(MVP)
ISN 1110           XPI=AP(1)*TP1+AP(2)*TP2+AP(3)*TP3
ISN 1111           YPI=AP(4)*TP1+AP(5)*TP2+AP(6)*TP3
ISN 1112           ZPI=AP(7)*TP1+AP(8)*TP2+AP(9)*TP3
ISN 1113           IF ((-XNBAR.GT.XPI).OR.(XPI.GT.XPBAR))  GO TO 1900
ISN 1115           IF ((-YNBAR.GT.YPI).OR.(YPI.GT.YPBAR))  GO TO 1900
ISN 1117           IF ((-ZNBAR.GT.ZPI).OR.(ZPI.GT.ZPBAR))  GO TO 1900
ISN 1119           KPEN=KPEN+1
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ISN 1120          IPEN(KPEN)=I                                                  00014190
ISN 1121          TPEN(KPEN)=TIME                                               00014200
ISN 1122          IPENSW(I)=1                                                   00014210
ISN 1123          PRINT 1080, I,TIME                                            00014220
ISN 1124     1080 FORMAT(1H0,' CONTROL VOLUME PENETRATED BY MASS ',I2,', TIME=',  00014230
                 1 F10.5)                                                       00014240
           C                                                                    00014250
           C      ZERO XCE AND XFE FOR ALL I'S PRIOR TO ENERGY CALCS BELOW.     00014260
           C                                                                    00014270
ISN 1125     1900 XCE(I) = 0.                                                   00014280
ISN 1126          XFE(I) = 0.                                                   00014290
ISN 1127     2000 CONTINUE                                                      00014300
ISN 1128          IF(NNP.EQ.0) GO TO 2008                                       00014310
           C                                                                    00014320
           C      NOW CALCULATE THE VELOCITIES AND ACCELERATIONS OF THE NODE    00014330
           C      POINTS. THESE ARE USED ONLY FOR OUTPUT DATA.                  00014340
           C                                                                    00014350
ISN 1130          DO 4000 J=1,NNP                                               00014360
ISN 1131          I = INP(J)                                                    00014370
ISN 1132          OMCRX = -R(I)*RY(J)+Q(I)*RZ(J)                                00014380
ISN 1133          OMCRY =  R(I)*RX(J)-P(I)*RZ(J)                                00014390
ISN 1134          OMCRZ = -Q(I)*RX(J)+P(I)*RY(J)                                00014400
ISN 1135          OMCCRX = -R(I)*OMCRY+Q(I)*OMCRZ                               00014410
ISN 1136          OMCCRY =  R(I)*OMCRX-P(I)*OMCRZ                               00014420
ISN 1137          OMCCRZ = -Q(I)*OMCRX+P(I)*OMCRY                               00014430
ISN 1138          UNP(J) = U(I)+OMCRX                                           00014440
ISN 1139          VNP(J) = V(I)+OMCRY                                           00014450
ISN 1140          WNP(J) = W(I)+OMCRZ                                           00014460
ISN 1141          IS = 9*(I-1)                                                  00014470
ISN 1142          DO 4010 KS=1,9                                                00014480
ISN 1143          IS = IS+1                                                     00014490
ISN 1144          AI(KS) = BIJ(IS)                                              00014500
ISN 1145     4010 CONTINUE                                                      00014510
ISN 1146          TX = AI(1)*RX(J)+AI(4)*RY(J)+AI(7)*RZ(J)                      00014520
ISN 1147          TY = AI(2)*RX(J)+AI(5)*RY(J)+AI(8)*RZ(J)                      00014530
ISN 1148          TZ = AI(3)*RX(J)+AI(6)*RY(J)+AI(9)*RZ(J)                      00014540
ISN 1149          XNP(J) = X(I)+TX                                              00014550
ISN 1150          YNP(J) = Y(I)+TY                                              00014560
ISN 1151          ZNP(J) = Z(I)+TZ                                              00014570
ISN 1152          XDNP(J) = AI(1)*UNP(J)+AI(4)*VNP(J)+AI(7)*WNP(J)              00014580
ISN 1153          YDNP(J) = AI(2)*UNP(J)+AI(5)*VNP(J)+AI(8)*WNP(J)              00014590
ISN 1154          ZDNP(J) = AI(3)*UNP(J)+AI(6)*VNP(J)+AI(9)*WNP(J)              00014600
ISN 1155          ACX = -RDOT(I)*RY(J)+QDOT(I)*RZ(J)                            00014610
ISN 1156          ACY =  RDOT(I)*RX(J)-PDOT(I)*RZ(J)                            00014620
ISN 1157          ACZ = -QDOT(I)*RX(J)+PDOT(I)*RY(J)                            00014630
ISN 1158          XACCNP(J) = XACC(I)+(ACX+OMCCRX)/386.                         00014640
ISN 1159          YACCNP(J) = YACC(I)+(ACY+OMCCRY)/386.                         00014650
ISN 1160          ZACCNP(J) = ZACC(I)+(ACZ+OMCCRZ)/386.                         00014660
ISN 1161          IF(TIME.NE.0.) GO TO 4020                                     00014670
ISN 1163          XACNPF(J) = XACCNP(J)                                         00014680
ISN 1164          YACNPF(J) = YACCNP(J)                                         00014690
ISN 1165          ZACNPF(J) = ZACCNP(J)                                         00014700
ISN 1166     4020 XNPFDJ = XNPFD(J)                                             00014710
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ISN 1167          YNPFDJ = YNPFD(J)
ISN 1168          ZNPFDJ = ZNPFD(J)
ISN 1169          IF(PFIL.EQ.0.) GO TO 4030
ISN 1171          XNPFD(J) = (XACCNP(J)-XACNPF(J))/PFIL
ISN 1172          YNPFD(J) = (YACCNP(J)-YACNPF(J))/PFIL
ISN 1173          ZNPFD(J) = (ZACCNP(J)-ZACNPF(J))/PFIL
ISN 1174          GO TO 4050
ISN 1175     4030 XNPFD(J) = 0.
ISN 1176          YNPFD(J) = 0.
ISN 1177          ZNPFD(J) = 0.
ISN 1178     4050 IF(TIME) 4000,4000,4040
             C    XACNPI,XIMNP(I) ETC ARE MASS NODE POINT IMPULSE CALCS 2-5-79
             C
ISN 1179     4040 XACNPI=XACNPF(J)
ISN 1180          YACNPI=YACNPF(J)
ISN 1181          ZACNPI=ZACNPF(J)
ISN 1182          XACNPF(J)=TT*XACNPF(J)+ET*(XANPFO(J)+DTHALF*(XNPFD(J)+XNPFDJ))
ISN 1183          YACNPF(J) = TT*YACNPF(J)+ET*(YANPFO(J)+DTHALF*(YNPFD(J)+YNPFDJ))
ISN 1184          ZACNPF(J) = TT*ZACNPF(J)+ET*(ZANPFO(J)+DTHALF*(ZNPFD(J)+ZNPFDJ))
ISN 1185          XIMPNP(J)=TT*XIMPNP(J)+ET*(XIMNPL(J)+DTHALF*(XACNPF(J)
                 1 +XACNPI))
ISN 1186          YIMPNP(J)=TT*YIMPNP(J)+ET*(YIMNPL(J)+DTHALF*(YACNPF(J)
                 1 +YACNPI))
ISN 1187          ZIMPNP(J)=TT*ZIMPNP(J)+ET*(ZIMNPL(J)+DTHALF*(ZACNPF(J)
                 1 +ZACNPI))
ISN 1188     4000 CONTINUE
             C
             C    ...CHECK INTEGRATION ERROR AND VARY DELTAT IF NECESSARY...
             C
ISN 1189     2008 CONTINUE
ISN 1190          IF (IVAR .EQ. 0) GO TO 2010
ISN 1192          IF (TIME) 2010,2010,2015
ISN 1193     2015 DELTA = 0.
ISN 1194          DT2 = 2. * DELTAT
ISN 1195          IF (ERR .LT. EL) DELTA = RATMAX
ISN 1197          IF ((ERR .GT. EU) .AND. (DELTAT .GT. MINDT))  DELTA = RATMIN
ISN 1199          IF ((DELTA.EQ.0.) .AND. (IPC.EQ.1))   DELTA = 1.0
ISN 1201          IF (DELTA .EQ. 0.) GO TO 2010
ISN 1203            IF (IPC .NE. 1.) GO TO 2019
ISN 1205                TREL = DMOD(TIME+DELTAT,TPRINT)
ISN 1206                TLEFT = TPRINT - TREL
ISN 1207                MPTSP = (TLEFT/DELTAT) + .5
ISN 1208                DELT1 = TLEFT / MPTSP
ISN 1209                IPRIN1 = MPTSP + IPC + 1
ISN 1210                GO TO 2018
ISN 1211     2019      MPTS = IPRINT - IPC
ISN 1212               IF ((MPTS.EQ.0) .OR. (MPTS.EQ.1)) GO TO 2010
ISN 1214               TREL = DMOD(TIME+DELTAT,TPRINT)
ISN 1215               TLEFT = TPRINT - TREL
ISN 1216               MPTSP = ((MPTS-1)/DELTA)  + .5
ISN 1217               DELT1 = TLEFT / MPTSP
ISN 1218               IPRIN1 = IPC + MPTSP+ 1
ISN 1219     2018      DTX = DELT1 - DELTAT
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ISN 1220            IF (DTX .EQ. 0.) GO TO 2010                                  00015250
ISN 1222            TIME1 = TIME                                                 00015260
ISN 1223            DT2 = DELTAT + DELT1                                         00015270
ISN 1224            DELTAT = DELT1                                               00015280
ISN 1225            DTHALF = .5 * DELTAT                                         00015290
ISN 1226            IPRINT = IPRIN1                                              00015300
              C                                                                  00015310
              C     ENERGY CALCULATIONS BY MASS.  CEIK AND CEIKF ALREADY SUMMED OVER 00015320
              C     TIME.  NOW SUM OVER SPRINGS FOR GIVEN MASS.                  00015330
              C                                                                  00015340
ISN 1227       2010 DO 2011 IKM=1,NSP                                            00015350
ISN 1228            I = II(IKM)                                                  00015360
ISN 1229            XCE(I) = XCE(I) + CEIK(IKM)                                  00015370
ISN 1230            XFE(I) = XFE(I) + CEIKF(IKM)                                 00015380
ISN 1231       2011 CONTINUE                                                     00015390
              C                                                                  00015400
              C     SET ZINIT(I)=Z(I) AT TIME=0                                  00015410
              C                                                                  00015420
ISN 1232            IF(TIME.NE.0.) GO TO 2012                                    00015430
ISN 1234            DO 2014 I=1,NM                                               00015440
ISN 1235            ZINIT(I)=Z(I)                                                00015450
ISN 1236       2014 CONTINUE                                                     00015460
ISN 1237       2012 XETOTL = 0.                                                  00015470
ISN 1238            KETOTL = 0.                                                  00015480
ISN 1239            PETOTL = 0.                                                  00015490
ISN 1240            SETOTL = 0.                                                  00015500
ISN 1241            DETOTL = 0.                                                  00015510
ISN 1242            CETOTL = 0.                                                  00015520
ISN 1243            FETOTL = 0.                                                  00015530
ISN 1244            DEVMAX = 0.                                                  00015540
ISN 1245            DO 2016 I = 1,NM                                             00015550
              C*****DON'T USE AN I IF IT'S = TO A J OF A DRI I,J PAIR            00015560
ISN 1246            DO 2017 IJ = 1,NB                                            00015570
ISN 1247            IF(IJPR(IJ).EQ.0) GO TO 2017                                 00015580
ISN 1249            IF(I.NE.JG(IJ)) GO TO 2017                                   00015590
ISN 1251            PEI(I) = 0.0                                                 00015600
ISN 1252            KEI(I) = 0.0                                                 00015610
ISN 1253            GO TO 2020                                                   00015620
ISN 1254       2017 CONTINUE                                                     00015630
ISN 1255            PEI(I) = -WGT(I)*Z(I)+ALIFT(I)*WTOT*(Z(I)-ZINIT(I))          00015640
ISN 1256            KEI(I) = .5*(WGT(I)*(U(I)*U(I)+V(I)*V(I)+W(I)*W(I))/386.0    00015650
                  1 +P(I)*(P(I)* XI(I)+Q(I)*XYI(I)+R(I)*XZI(I))                  00015660
                  2 +Q(I)*(P(I)*XYI(I)+Q(I)* YI(I)+R(I)*YZI(I))                  00015670
                  3 +R(I)*(P(I)*XZI(I)+Q(I)*YZI(I)+R(I)* ZI(I)))                 00015680
              C                                                                  00015690
              C     FOR A SYMMETRICAL MODEL WE MUST ADD KE AND PE CONTRIBUTIONS  00015700
              C     FROM THE OPPOSITE MASSES THAT ARE NOT INPUT EXPLICITLY.      00015710
              C                                                                  00015720
ISN 1257            IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020                   00015730
ISN 1259            PEI(I) = 2.*PEI(I)                                           00015740
ISN 1260            KEI(I) = 2.*KEI(I)                                           00015750
ISN 1261       2020 XETOT(I) = KEI(I)+PEI(I)+XSE(I)+XDE(I)+XCE(I)+XFE(I)         00015760
              C                                                                  00015770
```

```
                C      SUM OVER MASSES TO CHECK WITH OTHER ENERGY PRINT.                00015780
                C                                                                       00015790
ISN 1262               KETOTL = KETOTL + KEI(I)                                         00015800
ISN 1263               PETOTL = PETOTL + PEI(I)                                         00015810
ISN 1264               SETOTL = SETOTL + XSE(I)                                         00015820
ISN 1265               DETOTL = DETOTL + XDE(I)                                         00015830
ISN 1266               CETOTL = CETOTL + XCE(I)                                         00015840
ISN 1267               FETOTL = FETOTL + XFE(I)                                         00015850
ISN 1268               XETOTL = XETOTL + XETOT(I)                                       00015860
ISN 1269               IF(TIME.NE.0.) GO TO 2024                                        00015870
ISN 1271               XETOTO(I) = XETOT(I)                                             00015880
ISN 1272          2024 IF(XETOTO(I).NE.0) GO TO 2022                                    00015890
ISN 1274               XPCT(I) = 100.                                                   00015900
ISN 1275               GO TO 2030                                                       00015910
ISN 1276          2022 XPCT(I) = XETOT(I)/XETOTO(I)*100.                                00015920
ISN 1277          2030 DEV = ABS(XPCT(I)-100.)                                          00015930
ISN 1278               DEVMAX = AMAX1(DEVMAX,DEV)                                       00015940
ISN 1279          2016 CONTINUE                                                         00015950
                C                                                                       00015960
                C      VOLUME CHANGE CALCULATIONS                                       00015970
                C                                                                       00015980
ISN 1280               IF(NVCH) 2001,2001,2002                                          00015990
ISN 1281          2002 FLIP = 0.                                                        00016000
ISN 1282               DO 2003 MI=1,NVCH                                                00016010
ISN 1283               VOL(MI) = 1.                                                     00016020
ISN 1284               DO 2004 I=1,6                                                    00016030
ISN 1285               SUMX = 0.                                                        00016040
ISN 1286               SUMY = 0.                                                        00016050
ISN 1287               SUMZ = 0.                                                        00016060
                C                                                                       00016070
                C      EACH ROW OF KMATR CONTAINS THE FOUR CORNER NUMBERS FOR THE       00016080
                C      APPROPRIATE SIDE OF THE CUBE                                     00016090
                C                                                                       00016100
                C      EACH ROW OF INBUFF CONTAINS THE ACTUAL MASS NUMBERS FOR THE      00016110
                C      EIGHT CORNERS OF THE VOLUME                                      00016120
                C                                                                       00016130
ISN 1288               DO 2005 J=1,4                                                    00016140
ISN 1289               K = KMATR(I,J)                                                   00016150
ISN 1290               L = INBUFF(MI,K)                                                 00016160
                C                                                                       00016170
                C      FOR A SYMMETRICAL MODEL THE MASS NUMBER L MAY BE 0,SO WE USE     00016180
                C      THE MASS NUMBER FOR CORNER (K-1) AND CHANGE THE SIGN OF THE Y    00016190
                C      COORDINATE.SEE PG. 1-66 OF LR27699,KRASH USERS MANUAL.           00016200
                C                                                                       00016210
ISN 1291               IF(L.NE.0) GO TO 2100                                            00016220
ISN 1293               L = INBUFF(MI,K-1)                                               00016230
ISN 1294               Y(L) = -Y(L)                                                     00016240
ISN 1295               FLIP = 1.                                                        00016250
ISN 1296          2100 SUMX = SUMX + X(L)                                               00016260
ISN 1297               SUMY = SUMY + Y(L)                                               00016270
ISN 1298               SUMZ = SUMZ + Z(L)                                               00016280
ISN 1299               IF(FLIP.NE.1.) GO TO 2005                                        00016290
ISN 1301               Y(L) = -Y(L)                                                     00016300
```

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ISN 1302          FLIP = 0.                                              00016310
ISN 1303     2005 CONTINUE                                               00016320
ISN 1304          XVOL(I,1) = SUMX/4.D0                                  00016330
ISN 1305          XVOL(I,2) = SUMY/4.D0                                  00016340
ISN 1306          XVOL(I,3) = SUMZ/4.D0                                  00016350
ISN 1307     2004 CONTINUE                                               00016360
            C     NOW WE HAVE THE XYZ COORDINATES OF THE CENTERS OF THE SIX 00016370
            C     SIDES OF VOLUME M                                      00016380
ISN 1308          DO 2006 I=1,3                                          00016390
ISN 1309          SUM = 0.                                               00016400
ISN 1310          DO 2007 J=1,3                                          00016410
ISN 1311          DXVOL = XVOL(2*I,J) - XVOL(2*I-1,J)                    00016420
ISN 1312          SUM = SUM + DXVOL*DXVOL                                00016430
ISN 1313     2007 CONTINUE                                               00016440
ISN 1314          VOLLEN(MI,I) = SQRT(SUM)                               00016450
ISN 1315          DLVOL(MI,I) = VOLLEN(MI,I)-VOLENZ(MI,I)                00016460
ISN 1316          VOL(MI) = VOL(MI)*VOLLEN(MI,I)                         00016470
ISN 1317     2006 CONTINUE                                               00016480
ISN 1318     2003 CONTINUE                                               00016490
ISN 1319     2001 RETURN                                                 00016500
ISN 1320          END                                                    00016510
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*                                                                                   *
*                                                                                   *
*                                                                                   *
*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.             *
*                                                                                   *
*************************************************************************************

        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                           SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C         DATA SET D2334DOAIJ AT LEVEL 001 AS OF 04/28/78
               C         DATA SET D2332VDO   AT LEVEL 001 AS OF 02/03/78
               C         DATA SET D2332RDO   AT LEVEL 002 AS OF 06/21/77
  ISN 0002            SUBROUTINE DOAIJ
               C
  ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)
  ISN 0004            REAL*8 KUN
  ISN 0005            INTEGER*4 TITLE(40)
  ISN 0006            INTEGER*2 N1,NN
  ISN 0007            INTEGER*2 IJPR,IG,JG,MG(150),NG(150),INP(50),MNP(50)
  ISN 0008            DIMENSION SINCOS(6),XTHOLD(9,2),XYZIJI(9),XYZIJJ(9),PROD(9),
                     1 XIIJ(3)
  ISN 0009            DIMENSION XK3(6,6,150)
  ISN 0010            DIMENSION XMAS(6),FREQ(6),TEMP(9),SUMM(9),AIJTAI(9),AIJTAJ(9)
  ISN 0011            DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)
  ISN 0012            DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)
  ISN 0013            DIMENSION XXII(3),XXIJ(3)
  ISN 0014            DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50),PHIIJ0(150),THEIJ0(150),
                     1 PSIIJ0(150)
  ISN 0015            COMMON/DOIN/ CBAR(150)
  ISN 0016            COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),
                     1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,
                     2 XGDOT,YGDOT,ZGDOT
  ISN 0017            COMMON/INIDCP/ YDP(80)
  ISN 0018            COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
  ISN 0019            COMMON/NP00I4/ NNP
  ISN 0020            COMMON/NP00I2/ MG,NG,INP,MNP
  ISN 0021            COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,
                     1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)
  ISN 0022            COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                     1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                     2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                     3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                     4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                     5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                     6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                     7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                     8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                     9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                     A CEIKF(40),
                     B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
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                   C NM,NB,I,J,IG(150),JG(150),
                   D N1(900),NN(40),I,PR(150)
ISN 0023             EQUIVALENCE (XTHOLD(1,1),XYZIJI(1)),(XTHOLD(1,2),XYZIJJ(1))
ISN 0024             EQUIVALENCE (S1,SINCOS(1)),(C1,SINCOS(2)),(S2,SINCOS(3))
ISN 0025             EQUIVALENCE (C2,SINCOS(4)),(S3,SINCOS(5)),(C3,SINCOS(6))
ISN 0026             EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0027             SIN(X) = DSIN(X)
ISN 0028             COS(X) = DCOS(X)
ISN 0029             SQRT(X) = DSQRT(X)
ISN 0030             ATAN2(Y,X) = DATAN2(Y,X)
ISN 0031             PI = 3.14159265358979324D0
ISN 0032             IOLD=0
ISN 0033             DO 1100 I = 1,NM
ISN 0034             ARG=PHIDP(I)
ISN 0035             S1=SIN(ARG)
ISN 0036             C1=COS(ARG)
ISN 0037             ARG=THEDP(I)
ISN 0038             S2=SIN(ARG)
ISN 0039             C2=COS(ARG)
ISN 0040             ARG=PSIDP(I)
ISN 0041             S3=SIN(ARG)
ISN 0042             C3=COS(ARG)
ISN 0043             DO 1085 J = 1,6
ISN 0044             T=SINCOS(J)
ISN 0045             IF (T) 1070,1085,1075
ISN 0046        1070 T=-T
ISN 0047        1075 IF(T-1.E-10) 1080,1085,1085
ISN 0048        1080 SINCOS(J)=0.
ISN 0049        1085 CONTINUE
ISN 0050             J=9*(I-1)
                C MOVE AI'S TO OLD AI'S
ISN 0051             DO 1090 J2 = 1,9
ISN 0052        1090 OAI(J+J2)=BIJ(J+J2)
ISN 0053             S1S2=S1*S2
ISN 0054             C1S2=C1*S2
ISN 0055             BIJ(J+1)=C2*C3
ISN 0056             BIJ(J+2)=C2*S3
ISN 0057             BIJ(J+3)=-S2
ISN 0058             BIJ(J+4)=-C1*S3+S1S2*C3
ISN 0059             BIJ(J+5)=C1*C3+S1S2*S3
ISN 0060             BIJ(J+6)=S1*C2
ISN 0061             BIJ(J+7)=S1*S3+C1S2*C3
ISN 0062             BIJ(J+8)=-S1*C3+C1S2*S3
ISN 0063             BIJ(J+9)=C1*C2
ISN 0064        1100 CONTINUE
ISN 0065             PRINT 2021
ISN 0066        2021 FORMAT(/ 1X,'BEAM UNCOUPLED,UNDAMPED FREQUENCIES (CPS)' /
                   1 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                   2 5X,'(1)',9X,'(2)',9X,'(3)',9X,'(4)',9X,
                   3 '(5)',9X,'(6)')
                C
ISN 0067             DO 1010 IJ = 1,NB
ISN 0068             I = IG(IJ)
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```
ISN 0069          J = JG(IJ)
ISN 0070          M = MG(IJ)
ISN 0071          N = NG(IJ)
ISN 0072          IF(J.NE.0) GO TO 3300
ISN 0074          J = 81
ISN 0075          IF(M.NE.0) GO TO 3301
            C
            C     IF J.EQ.0,WE HAVE A SYMMETRICAL MODEL IN WHICH BEAM IJ
            C     CONNECTS NODE POINT (I,M) TO AN IMAGINARY POINT (J,N=0)
            C     LOCATED SYMMETRICALLY ACROSS THE AIRPLANE PLANE OF SYMMETRY
            C     (X-Z PLANE). FOR THESE TRANSVERSE BEAMS,THE CONDITIONS AT (J,N)
            C     ARE DEDUCED FROM THE STATE AT (I,M). J IS CHANGED TO 81 BECAUSE
            C     THE IBM 360-91 WILL NOT ACCEPT A ZERO SUBSCRIPTED VECTOR.
            C
            C     IF M.EQ.0,THERE IS NO NODE POINT AT I.
            C
ISN 0077     3302 XMODI = -XDP(I)
ISN 0078          YMODI = -YDP(I)
ISN 0079          ZMODI = -ZDP(I)
ISN 0080          GO TO 3303
            C
            C     THIS LOOP GETS NODE POINT NUMBER JI KNOWING I AND M.
            C
ISN 0081     3301 DO 3305 JI=1,NNP
ISN 0082          IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 3306
ISN 0084     3305 CONTINUE
ISN 0085     3306 XMODI = -XNPDP(JI)
ISN 0086          YMODI = -YNPDP(JI)
ISN 0087          ZMODI = -ZNPDP(JI)
ISN 0088     3303 IF(J.NE.81) GO TO 3310
            C
            C     IF J.EQ.81,WE HAVE A SYMMETRICAL MODEL. NOW CALCULATE
            C     CONDITIONS AT J,N BASED ON KNOWLEDGE OF STATE AT I,M.
            C
ISN 0090          XMODJ =  XMODI
ISN 0091          YMODJ = -YMODI
ISN 0092          ZMODJ =  ZMODI
ISN 0093          GO TO 3320
ISN 0094     3300 IF(M.EQ.0) GO TO 3302
ISN 0096          GO TO 3301
ISN 0097     3310 IF(N.NE.0) GO TO 3311
            C
            C     IF N.EQ.0,THERE IS NO NODE POINT AT J.
            C
ISN 0099          XMODJ = -XDP(J)
ISN 0100          YMODJ = -YDP(J)
ISN 0101          ZMODJ = -ZDP(J)
ISN 0102          GO TO 3320
            C
            C     THIS LOOP GETS NODE POINT NUMBER JJ KNOWING J AND N.
            C
ISN 0103     3311 DO 3312 JJ=1,NNP
ISN 0104          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 3313
```

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ISN 0106      3312 CONTINUE
ISN 0107      3313 XMODJ = -XNPDP(JJ)
ISN 0108           YMODJ = -YNPDP(JJ)
ISN 0109           ZMODJ = -ZNPDP(JJ)
              C
              C    ALL OF THE ABOVE PATHS LEAD TO HERE. WE NOW HAVE POSITIONS
              C    (XMOD,ETC.) OF BOTH ENDS OF BEAM IJ.
              C
ISN 0110      3320 XIJ = XMODJ-XMODI
ISN 0111           YIJ = YMODJ-YMODI
ISN 0112           ZIJ = ZMODJ-ZMODI
              C
              C CALCULATE AIJ. FIRST CALCULATE PHIIJ, THEIJ, PSIIJ.
              C
ISN 0113           PHIIJ0(IJ) = 0.
ISN 0114           IF(XIJ.EQ.0.AND.YIJ.EQ.0.) GO TO 3330
ISN 0116           PSIIJ0(IJ) = ATAN2(YIJ,XIJ)
ISN 0117           GO TO 3340
ISN 0118      3330 PSIIJ0(IJ) = 0.
ISN 0119      3340 THEIJ0(IJ) = -ATAN2(ZIJ,SQRT(XIJ*XIJ+YIJ*YIJ))
              C
              C  ZERO OUT VERY SMALL SIN AND COS TERMS.
              C
ISN 0120           ARG = PHIIJ0(IJ)
ISN 0121           S1 = SIN(ARG)
ISN 0122           C1 = COS(ARG)
ISN 0123           ARG = THEIJ0(IJ)
ISN 0124           S2 = SIN(ARG)
ISN 0125           C2 = COS(ARG)
ISN 0126           ARG = PSIIJ0(IJ)
ISN 0127           S3 = SIN(ARG)
ISN 0128           C3 = COS(ARG)
ISN 0129           DO 3392 J1 = 1,6
ISN 0130           T = SINCOS(J1)
ISN 0131           IF(T) 3394,3392,3398
ISN 0132      3394 T = -T
ISN 0133      3398 IF(T-1.E-10) 3396,3392,3392
ISN 0134      3396 SINCOS(J1) = 0.0
ISN 0135      3392 CONTINUE
ISN 0136           S1S2 = S1*S2
ISN 0137           C1S2 = C1*S2
ISN 0138           AIJ(1) = C2*C3
ISN 0139           AIJ(2) = C2*S3
ISN 0140           AIJ(3) = -S2
ISN 0141           AIJ(4) = -C1*S3 + S1S2*C3
ISN 0142           AIJ(5) = C1*C3 + S1S2*S3
ISN 0143           AIJ(6) = S1*C2
ISN 0144           AIJ(7) = S1*S3 + C1S2*C3
ISN 0145           AIJ(8) =-S1*C3 + C1S2*S3
ISN 0146           AIJ(9) = C1*C2
ISN 0147           J2 = 9*(IJ-1)
ISN 0148           CBIJ = CBAR(IJ)
ISN 0149           IF ((IOLD.NE.0).AND.(I.EQ.IOLD))  GO TO 1120
```

```
ISN 0151          IS=9*(I-1)
ISN 0152          DO 1110 J2 = 1,9
ISN 0153          IS=IS+1
ISN 0154     1110 AI(J2)=BIJ(IS)
ISN 0155     1120 IOLD=I
ISN 0156          IF(J.NE.81) GO TO 1121
            C
            C     IF J=81,WE HAVE A SYMMETRICAL MODEL AND MUST CALCULATE AJ BASED
            C     ON AI RATHER THAN EULER ANGLES FOR MASS J,WHICH DOESNT EXIST.
            C
ISN 0158          DO 1123 J2=1,9
ISN 0159          AJ(J2) = AI(J2)
ISN 0160     1123 CONTINUE
ISN 0161          AJ(2) = -AJ(2)
ISN 0162          AJ(4) = -AJ(4)
ISN 0163          AJ(6) = -AJ(6)
ISN 0164          AJ(8) = -AJ(8)
ISN 0165          GO TO 1122
ISN 0166     1121 IS=9*(J-1)
ISN 0167          DO 1125 J2 = 1,9
ISN 0168          IS=IS+1
ISN 0169     1125 AJ(J2) = BIJ(IS)
            C
            C  CALCULATE AIJTAJ AND AIJTAI.  FILL TEMP WITH EITHER AJ OR AI.
            C
ISN 0170     1122 DO 6000 I3=1,2
ISN 0171          DO 6010 I4=1,9
ISN 0172          IF(I3.EQ.2) GO TO 6020
ISN 0174          TEMP(I4) = AJ(I4)
ISN 0175          GO TO 6010
ISN 0176     6020 TEMP(I4) = AI(I4)
ISN 0177     6010 CONTINUE
ISN 0178          L2 = 0
ISN 0179          DO 6030 K2=1,3
ISN 0180          DO 6040 J2=1,3
ISN 0181          L2 = L2+1
ISN 0182          SUMM(L2) = 0.
ISN 0183          DO 6050 I2=1,3
ISN 0184          SUMM(L2) = SUMM(L2) + AIJ(3*(J2-1)+I2)*TEMP(3*(K2-1)+I2)
ISN 0185     6050 CONTINUE
ISN 0186          IF(I3.EQ.2) GO TO 6060
ISN 0188          AIJTAJ(L2) = SUMM(L2)
ISN 0189          GO TO 6040
ISN 0190     6060 AIJTAI(L2) = SUMM(L2)
ISN 0191     6040 CONTINUE
ISN 0192     6030 CONTINUE
ISN 0193     6000 CONTINUE
            C
            C COMPUTE BEAM FREQUENCY AND DAMPING CONSTANTS.
            C
ISN 0194          KKS=I
ISN 0195          DO 1312 KS = 1,2
ISN 0196          IF (KS.EQ.2.AND.J.NE.81) KKS=J
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ISN 0198          XTHOLD(1,KS)=XI(KKS)                                              00002550
ISN 0199          XTHOLD(2,KS)=XYI(KKS)                                             00002560
ISN 0200          XTHOLD(3,KS)=XZI(KKS)                                             00002570
ISN 0201          XTHOLD(4,KS)=XYI(KKS)                                             00002580
ISN 0202          XTHOLD(5,KS)=YI(KKS)                                              00002590
ISN 0203          XTHOLD(6,KS)=YZI(KKS)                                             00002600
ISN 0204          XTHOLD(7,KS)=XZI(KKS)                                             00002610
ISN 0205          XTHOLD(8,KS)=YZI(KKS)                                             00002620
ISN 0206     1312 XTHOLD(9,KS)=ZI(KKS)                                              00002630
            C                                                                       00002640
            C  MASS I AND J INERTIAS ARE IN XYZIJI AND XYZIJJ WHICH ARE             00002650
            C  EQUIVALENCED TO XTHOLD.  NOW TRANSFORM BOTH TO BEAM IJ AXES          00002660
            C  BY PREMULTIPLYING BY AIJTAI(OR AIJTAJ) AND POSTMULTIPLYING           00002670
            C  BY THE TRANSPOSE OF SAME.  XII AND XIJ ARE DIAGONAL ELEMENTS         00002680
            C  OF RESULTING INERTIA MATRIX FOR MASS I AND J, IN BEAM AXES.          00002690
            C                                                                       00002700
ISN 0207          ABT1=XYZIJI(1)*AIJTAI(1)+XYZIJI(4)*AIJTAI(4)+XYZIJI(7)*AIJTAI(7)  00002710
ISN 0208          ABT2=XYZIJI(2)*AIJTAI(1)+XYZIJI(5)*AIJTAI(4)+XYZIJI(8)*AIJTAI(7)  00002720
ISN 0209          ABT3=XYZIJI(3)*AIJTAI(1)+XYZIJI(6)*AIJTAI(4)+XYZIJI(9)*AIJTAI(7)  00002730
ISN 0210          ABT4=XYZIJI(1)*AIJTAI(2)+XYZIJI(4)*AIJTAI(5)+XYZIJI(7)*AIJTAI(8)  00002740
ISN 0211          ABT5=XYZIJI(2)*AIJTAI(2)+XYZIJI(5)*AIJTAI(5)+XYZIJI(8)*AIJTAI(8)  00002750
ISN 0212          ABT6=XYZIJI(3)*AIJTAI(2)+XYZIJI(6)*AIJTAI(5)+XYZIJI(9)*AIJTAI(8)  00002760
ISN 0213          ABT7=XYZIJI(1)*AIJTAI(3)+XYZIJI(4)*AIJTAI(6)+XYZIJI(7)*AIJTAI(9)  00002770
ISN 0214          ABT8=XYZIJI(2)*AIJTAI(3)+XYZIJI(5)*AIJTAI(6)+XYZIJI(8)*AIJTAI(9)  00002780
ISN 0215          ABT9=XYZIJI(3)*AIJTAI(3)+XYZIJI(6)*AIJTAI(6)+XYZIJI(9)*AIJTAI(9)  00002790
ISN 0216          XXII(1) = AIJTAI(1)*ABT1+AIJTAI(4)*ABT2+AIJTAI(7)*ABT3            00002800
ISN 0217          XXII(2) = AIJTAI(2)*ABT4+AIJTAI(5)*ABT5+AIJTAI(8)*ABT6            00002810
ISN 0218          XXII(3) = AIJTAI(3)*ABT7+AIJTAI(6)*ABT8+AIJTAI(9)*ABT9            00002820
ISN 0219          ABT1=XYZIJJ(1)*AIJTAJ(1)+XYZIJJ(4)*AIJTAJ(4)+XYZIJJ(7)*AIJTAJ(7)  00002830
ISN 0220          ABT2=XYZIJJ(2)*AIJTAJ(1)+XYZIJJ(5)*AIJTAJ(4)+XYZIJJ(8)*AIJTAJ(7)  00002840
ISN 0221          ABT3=XYZIJJ(3)*AIJTAJ(1)+XYZIJJ(6)*AIJTAJ(4)+XYZIJJ(9)*AIJTAJ(7)  00002850
ISN 0222          ABT4=XYZIJJ(1)*AIJTAJ(2)+XYZIJJ(4)*AIJTAJ(5)+XYZIJJ(7)*AIJTAJ(8)  00002860
ISN 0223          ABT5=XYZIJJ(2)*AIJTAJ(2)+XYZIJJ(5)*AIJTAJ(5)+XYZIJJ(8)*AIJTAJ(8)  00002870
ISN 0224          ABT6=XYZIJJ(3)*AIJTAJ(2)+XYZIJJ(6)*AIJTAJ(5)+XYZIJJ(9)*AIJTAJ(8)  00002880
ISN 0225          ABT7=XYZIJJ(1)*AIJTAJ(3)+XYZIJJ(4)*AIJTAJ(6)+XYZIJJ(7)*AIJTAJ(9)  00002890
ISN 0226          ABT8=XYZIJJ(2)*AIJTAJ(3)+XYZIJJ(5)*AIJTAJ(6)+XYZIJJ(8)*AIJTAJ(9)  00002900
ISN 0227          ABT9=XYZIJJ(3)*AIJTAJ(3)+XYZIJJ(6)*AIJTAJ(6)+XYZIJJ(9)*AIJTAJ(9)  00002910
ISN 0228          XXIJ(1) = AIJTAJ(1)*ABT1+AIJTAJ(4)*ABT2+AIJTAJ(7)*ABT3            00002920
ISN 0229          XXIJ(2) = AIJTAJ(2)*ABT4+AIJTAJ(5)*ABT5+AIJTAJ(8)*ABT6            00002930
ISN 0230          XXIJ(3) = AIJTAJ(3)*ABT7+AIJTAJ(6)*ABT8+AIJTAJ(9)*ABT9            00002940
            C                                                                       00002950
            C  NOW CALCULATE EQUIVALENT MASS AND FREQUENCY.  FINALLY,               00002960
            C  DAMPING CONSTANT = CBIJ/PI/FREQ.  THIS IS USED IN DERIV.             00002970
            C                                                                       00002980
ISN 0231          DO 1032 K=1,3                                                     00002990
ISN 0232          IF(J.NE.81) GO TO 1034                                            00003000
ISN 0234          XMAS(K) = WGT(I)/2./386.                                          00003010
ISN 0235          XMAS(K+3) = XXII(K)/2.                                            00003020
ISN 0236          GO TO 1036                                                        00003030
ISN 0237     1034 XMAS(K) = WGT(I)*WGT(J)/(WGT(I)+WGT(J))/386.                      00003040
ISN 0238          XMAS(K+3) = XXII(K)*XXIJ(K)/(XXII(K)+XXIJ(K))                     00003050
ISN 0239     1036 FREQ(K) = SQRT(XK3(K,K,IJ)/XMAS(K))/2/PI                          00003060
ISN 0240          IF(FREQ(K).NE.0.) GO TO 1400                                      00003070
```

```
ISN 0242          C(K,IJ) = 0.
ISN 0243          GO TO 1410
ISN 0244     1400 C(K,IJ) = CBIJ/PI/FREQ(K)
ISN 0245     1410 FREQ(K+3) = SQRT(XK3(K+3,K+3,IJ)/XMAS(K+3))/2/PI
ISN 0246          IF(FREQ(K+3).NE.0.) GO TO 1420
ISN 0248          C(K+3,IJ) = 0.
ISN 0249          GO TO 1032
ISN 0250     1420 C(K+3,IJ) = CBIJ/PI/FREQ(K+3)
ISN 0251     1032 CONTINUE
ISN 0252          PRINT 1030,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),(FREQ(K),K=1,6)
ISN 0253     1030 FORMAT(1X,5I3,1P6E12.4)
ISN 0254     1010 CONTINUE
ISN 0255          PRINT 1021
ISN 0256     1021 FORMAT(/ 1X,'DAMPING TERMS (LB/IN/SEC,TRANSLATIONS (1)-(3) AND LB-
                 1IN-SEC,ROTATIONS (4)-(6))' / 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',
                 2 7X,'(1)',12X,
                 3 '(2)',12X,'(3)',12X,'(4)',12X,'(5)',12X,'(6)')
ISN 0257          PRINT 1022,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),
                 1 (C(K,IJ),K=1,6),IJ=1,NB)
ISN 0258     1022 FORMAT(1X,5I3,1P6E15.5)
ISN 0259          PRINT 2053
ISN 0260     2053 FORMAT(/ 1X,'EULER ANGLES, BEAM IJ TO AIRPLANE (RADIANS)')
ISN 0261          PRINT 2301
ISN 0262     2301 FORMAT(2X,'IJ  I  J  M  N',4X,'THEIJ0(IJ)',5X,'PSIIJ0(IJ)')
ISN 0263          PRINT 2300,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),
                 1 THEIJ0(IJ),PSIIJ0(IJ),IJ=1,NB)
ISN 0264     2300 FORMAT (1X,5I3,1P2E15.5)
ISN 0265          RETURN
ISN 0266          END
```

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LEVEL 21.8 ( JUN 74 )                    OS/360  FORTRAN H                    DATE  79.177/14.16.02

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      *          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.        *
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      ********************************************************************************

        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                           SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334ECHO  AT LEVEL 002 AS OF 07/20/78
  ISN 0002             SUBROUTINE ECHO
              C
  ISN 0003             DIMENSION CARD (20)
              C
              C
  ISN 0004             N = 0
  ISN 0005             WRITE (6, 10)
  ISN 0006          10 FORMAT (1H1, 30X, 'ECHO OF THE INPUT DATA IN CARD IMAGE FORMAT', /
                      1 '0', 18X, '1', 9X, '2', 9X, '3', 9X, '4', 9X, '5', 9X, '6', 9X,
                      2 '7',  9X, '8', / 10H CARD NO. , 8 (10H1234567890 ) / )
              C
  ISN 0007          20 N = N + 1
  ISN 0008             IF (MOD (N, 51) .EQ. 0 ) WRITE (6, 10)
              C
  ISN 0010             READ (5, 30, ERR=40, END=70) CARD
  ISN 0011          30 FORMAT (20A4)
              C
  ISN 0012             WRITE (6, 50) N, CARD
  ISN 0013          50 FORMAT (I8, 2X, 20A4)
              C
  ISN 0014             GO TO 20
  ISN 0015          40 WRITE (6, 60)
  ISN 0016          60 FORMAT ('0    10. I/O ERROR ON READ - WILL REWIND INPUT FILE AND R
                      1ETURN' )
              C
  ISN 0017          70 REWIND 5
              C
  ISN 0018             RETURN
  ISN 0019             END
```

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*            LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                 *
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     COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                        SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C           DATA SET D2334EULER AT LEVEL 001 AS OF 03/24/76
ISN 0002            SUBROUTINE EULER(A,PHI,THETA,PSI)                          00000010
ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                  00000020
ISN 0004            DIMENSION A(9)                                             00000030
ISN 0005            SIN(X) = DSIN(X)                                           00000040
ISN 0006            COS(X) = DCOS(X)                                           00000050
ISN 0007            S1 = SIN(PHI)                                              00000060
ISN 0008            C1 = COS(PHI)                                              00000070
ISN 0009            S2 = SIN(THETA)                                            00000080
ISN 0010            C2 = COS(THETA)                                            00000090
ISN 0011            S3 = SIN(PSI)                                              00000100
ISN 0012            C3 = COS(PSI)                                              00000110
ISN 0013            A(1) =  C2*C3                                              00000120
ISN 0014            A(2) =  C2*S3                                              00000130
ISN 0015            A(3) = -S2                                                 00000140
ISN 0016            A(4) = -C1*S3+S1*S2*C3                                     00000150
ISN 0017            A(5) =  C1*C3+S1*S2*S3                                     00000160
ISN 0018            A(6) =  S1*C2                                              00000170
ISN 0019            A(7) =  S1*S3+C1*S2*C3                                     00000180
ISN 0020            A(8) = -S1*C3+C1*S2*S3                                     00000190
ISN 0021            A(9) =  C1*C2                                              00000200
ISN 0022            RETURN                                                     00000210
ISN 0023            END                                                        00000220
```

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*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                *
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    COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C            DATA SET D2334FSHEL AT LEVEL 002 AS OF 05/17/78
ISN 0002              SUBROUTINE FSHELL(ARRAY,KEY,N)
              C
ISN 0003              IMPLICIT REAL*8(A-H,O-Z)
ISN 0004              INTEGER*2 N
              C
              C       THIS IS A FORTRAN SUBROUTINE FOR SORTING AN INDEPENDENT ARRAY OF
              C       SIZE N INTO ASCENDING ORDER(ALGERBRAICALLY LEAST FIRST), AND
              C       PROVIDING A 'KEY' ARRAY WHICH WILL ALLOW SUBROUTINE SHELLX TO
              C       RETURN DEPENDENT ARRAYS TO THEIR ORIGINAL CORRESPONDENCE WITH THE
              C       INDEPENDENT ARRAY.
              C
ISN 0005              DIMENSION ARRAY(1),KEY(1)
              C
              C       ESTABLISH THE INITIAL CONDITION OF THE KEY ARRAY.
              C
ISN 0006              DO 10 I=1, N
ISN 0007           10 KEY(I) = I
              C
              C       ESTABLISH THE INITIAL CONDITION FOR M, M IS THE CURRENT NUMBER
              C       OF SUBSETS INTO WHICH IARRAY HAS BEEN PARTITIONED.
              C
ISN 0008              M = N
              C
              C       REDUCE M, WHEN THE ALGORITHM PROCEEDS WITH THE REDUCED M, THE
              C       EFFECT IS A MERGE OF THE OLD SUBSETS INTO ABOUT HALF AS MANY
              C       NEW.  INTIALLY, IARRAY IS PARTITIONED INTO ABOUT N/2 SUBSETS,
              C       EACH OF WHICH CONTAINS 2 ELEMENTS, WITH THE EXCEPTION THAT ONE
              C       SUBSET WILL CONTAIN 3 ELEMENTS IF N IS ODD.  IT IS RECOMMENDED
              C       THAT A SAMPLE PROBLEM BE WORKED BY HAND TO UNDERSTAND THE
              C       MECHANISM OF THE PARTITIONING.
              C
ISN 0009           20 M = M / 2
              C
              C       TEST THE REDUCED M.  IF M IS ZERO, THE ENTIRE IARRAY HAS BEEN
              C       SORTED, AND CONTROL IS RETURNED TO THE CALLING PROGRAM.'
              C
ISN 0010              IF(M) 30,30,40
ISN 0011           30 RETURN
              C
              C       SET K=N-M.  THE ELEMENTS IN IARRAY FROM IARRAY(1) TO IARRAY(K)
```

```
           C      WILL BE USED AS 'BASE' ELEMENTS FOR COMPARISIONS.  THAT IS,
           C      IARRAY(I) WILL BE COMPARED WITH IARRAY(I+M).  THUS, ALL
           C      ELEMENTS IN IARRAY WILL ENTER THE COMPARISON SEQUENCE.
           C
ISN 0012       40 K = N - M
ISN 0013          DO 70 J=1, K
           C
           C      SINCE THE INDEX ADDRESSING THE 'BASE' ELEMENT MAY BE MODIFIED
           C      'BACKWARDS' BY THE FOLLOWING CODE, SET I=J AND USE I FOR
           C      THE 'BASE' INDEX.  THIS PRESERVES THE CORRECT VALUE OF J FOR THE
           C      NEXT 'BASE'.
           C
ISN 0014          I = J
           C
           C      II IS CREATED TO REFERENCE THE NEXT HEGHEST ELEMENT IN THE
           C      CURRENT SUBSET, WHICH IS TO BE COMPARED WITH IARRAY(I).
           C
ISN 0015       50 II = I + M
           C
           C      COMPARE ARRAY(I) WITH ARRAY(II)
           C
ISN 0016          IF(ARRAY(I) - ARRAY(II)) 70,70,60
           C
           C
ISN 0017       60 TIMBO = ARRAY(I)
ISN 0018          ARRAY(I) = ARRAY(II)
ISN 0019          ARRAY(II) = TIMBO
ISN 0020          TIMBO = KEY(I)
ISN 0021          KEY(I) = KEY(II)
ISN 0022          KEY(II) = TIMBO
           C
           C
ISN 0023          I = I - M
ISN 0024          IF(I) 70,70,50
           C
           C      THE ELEMENT IS PROPERLY PLACED IN ITS SUBSET.  EXAMINE THE NEXT
           C      'BASE' ELEMENT.
           C
ISN 0025       70 CONTINUE
           C
           C      ALL OF THE M SUBSETS HAVE BEEN SORTED
           C
ISN 0026          GO TO 20
ISN 0027          END
```

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*       LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.                  *
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       COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                          SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                C        DATA SET D2334GENMO AT LEVEL 011 AS OF 06/25/79
                C        DATA SET D2332MGM   AT LEVEL 001 AS OF 12/08/77              00000010
                C        DATA SET D2332NGM   AT LEVEL 001 AS OF 11/02/77              00000020
                C        DATA SET D2332QGM   AT LEVEL 001 AS OF 07/26/77              00000030
  ISN 0002            SUBROUTINE GENMOD                                               00000040
                C                                                                     00000050
  ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                       00000060
  ISN 0004            REAL*8 KUN                                                      00000070
  ISN 0005            REAL*8 LBAR,MU,KE                                               00000080
  ISN 0006            REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)            00000090
  ISN 0007            INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                     00000100
  ISN 0008            INTEGER*4 DIR                                                   00000110
  ISN 0009            INTEGER*4 TITLE(40),BLANK,STOP                                  00000120
  ISN 0010            INTEGER*2 CHUG,INBUFF,INBUF(80)                                 00000130
  ISN 0011            INTEGER*2 II(40),KK(40),MM(40),MQ(180),NQ(180),MG(150),NG(150)  00000140
  ISN 0012            INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)             00000150
  ISN 0013            INTEGER*2 IG,JG,NPNP(80),NEWNP(50),INP(50),MNP(50)              00000160
  ISN 0014            INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR          00000170
  ISN 0015            INTEGER*2 NI,NN,IBS,JBS                                         00000180
  ISN 0016            INTEGER*2 IJSAVE(180)                                           00000190
  ISN 0017            INTEGER*2 NKMVEC(150)                                           00000200
  ISN 0018            INTEGER*2 OLDNLB(180)                                           00000210
  ISN 0019            DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)                         00000220
  ISN 0020            DIMENSION G(150),VMAX2(6,150),FMAX2(6,150)                      00000230
  ISN 0021            DIMENSION VMAX3(6,150),FMAX3(6,150)                             00000240
  ISN 0022            DIMENSION XK3(6,6,150)                                          00000250
  ISN 0023            DIMENSION IJFRT(14),VMAXT(6),FMAXT(6)                           00000260
  ISN 0024            DIMENSION MASSNO(50),DIR(50),NPTS(50)                           00000270
  ISN 0025            DIMENSION IPHDP(80)                                             00000280
  ISN 0026            COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),   00000290
                     1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000300
                     2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180), 00000310
                     3 MVP                                                            00000320
  ISN 0027            COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),         00000330
                     1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),  00000340
                     2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                   00000350
  ISN 0028            COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),     00000360
                     1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)        00000370
  ISN 0029            COMMON/DOIN/ CBAR(150)                                          00000380
  ISN 0030            COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),       00000390
                     1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT         00000400
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ISN 0031          COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),                    00000410
                 1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),         00000420
                 2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT                          00000430
ISN 0032          COMMON/INDEAC/ NACC                                               00000440
ISN 0033          COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                 00000450
                 1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,              00000460
                 2 XGDOT,YGDOT,ZGDOT                                               00000470
ISN 0034          COMMON/INIDCP/ YDP(80)                                            00000480
ISN 0035          COMMON/INPR/ NDRI,NSP                                             00000490
ISN 0036          COMMON/INCFIC/ BETA                                               00000500
ISN 0037          COMMON/MACFIN/ TMAX,IPRINT                                        00000510
ISN 0038          COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                                00000520
ISN 0039          COMMON/NP00I4/ NNP                                                00000530
ISN 0040          COMMON/NP00I2/ MG,NG,INP,MNP                                      00000540
ISN 0041          COMMON/NP01I2/ II,KK,MM                                           00000550
ISN 0042          COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN                        00000560
ISN 0043          COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                  00000570
ISN 0044          COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),        00000580
                 1  YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20), 00000590
                 2  ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO       00000600
ISN 0045          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000610
                 1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),           00000620
                 2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),          00000630
                 3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),   00000640
                 4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80), 00000650
                 5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT, 00000660
                 6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                            00000670
                 7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,            00000680
                 8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),          00000690
                 9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),        00000700
                 A CEIKF(40),                                                      00000710
                 B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                           00000720
                 C NM,NB,I,J,IG(150),JG(150),                                      00000730
                 D N1(900),NN(40),IJPR(150)                                        00000740
ISN 0046          COMMON/COMMR8/ G                                                  00000750
ISN 0047          COMMON/UB/ DB(150),IJUB(150),NUB                                  00000760
ISN 0048          COMMON/STUFF/ NEWI(80),NEWIJ(150),NMOLD,NBOLD                     00000770
ISN 0049          COMMON/COMMR4/ KR    ,LDP    ,LDP1                                00000780
ISN 0050          COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,                         00000790
                 1             NPH    ,NMTL  ,NPTS  ,NVBM  ,IJPRT ,IPHDP,NFBM      00000800
ISN 0051          COMMON/COMMI2/ IQ           ,JQ           ,LQ    ,NPQ    ,INBUF , 00000810
                 1             NKMVEC,IJSAVE                                       00000820
ISN 0052          COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT       00000830
ISN 0053          EQUIVALENCE (XK(1),XK3(1,1,1))                                    00000840
ISN 0054          EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))                 00000850
ISN 0055          EQUIVALENCE (VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))               00000860
ISN 0056          EQUIVALENCE (MASSNO(1),INDEX(1,1)),(DIR(1),INDEX(1,2))            00000870
ISN 0057          DO 1 I=1,NM                                                       00000880
ISN 0058          NEWI(I) = 0                                                       00000890
ISN 0059        1 CONTINUE                                                          00000900
ISN 0060          NMNEW = NM                                                        00000910
ISN 0061          NMOLD = NM                                                        00000920
ISN 0062          NNPOLD = NNP                                                      00000930
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A-80

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              C
              C     CARDS 0100
              C
    ISN 0063        DO 10 I=1,NM
    ISN 0064        IF(YDP(I).EQ.0.) GO TO 10
    ISN 0066        NMNEW = NMNEW+1
    ISN 0067        NEWI(I) = NMNEW
    ISN 0068        WGT(NMNEW) = WGT(I)
    ISN 0069        XDP(NMNEW) = XDP(I)
    ISN 0070        YDP(NMNEW) = -YDP(I)
    ISN 0071        ZDP(NMNEW) = ZDP(I)
    ISN 0072        XI(NMNEW) = XI(I)
    ISN 0073        YI(NMNEW) = YI(I)
    ISN 0074        ZI(NMNEW) = ZI(I)
    ISN 0075     10 CONTINUE
    ISN 0076        NM = NMNEW
              C
              C     CARDS 0200
              C
    ISN 0077        IF(NNP.EQ.0) GO TO 2000
    ISN 0079        DO 2001 I=1,NM
    ISN 0080        NPNP(I) = 0
    ISN 0081   2001 CONTINUE
    ISN 0082        DO 2002 JJ=1,NNP
    ISN 0083        NEWNP(JJ) = 0
    ISN 0084        I = INP(JJ)
    ISN 0085        NPNP(I) = NPNP(I)+1
    ISN 0086   2002 CONTINUE
              C
              C     NPNP(I) CONTAINS THE NUMBER OF NODE POINTS ATTACHED TO
              C     MASS I, FOR ANY MASSES THAT HAVE NODE POINTS.
              C
    ISN 0087        NNPNEW = NNP
    ISN 0088        DO 2010 JJ=1,NNP
    ISN 0089        I = INP(JJ)
    ISN 0090        M = MNP(JJ)
    ISN 0091        IF(NEWI(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 2010
    ISN 0093        NNPNEW = NNPNEW+1
    ISN 0094        NEWNP(JJ) = NNPNEW
    ISN 0095        XNPDP(NNPNEW) =  XNPDP(JJ)
    ISN 0096        YNPDP(NNPNEW) = -YNPDP(JJ)
    ISN 0097        ZNPDP(NNPNEW) =  ZNPDP(JJ)
    ISN 0098        IF(NEWI(I).NE.0) GO TO 2020
              C
              C     THIS IS CENTERLINE MASS WITH OFF-CENTER NODE POINT.
              C
    ISN 0100        NPNP(I) = NPNP(I)+1
    ISN 0101        INP(NNPNEW) = I
    ISN 0102        MNP(NNPNEW) = NPNP(I)
    ISN 0103        GO TO 2010
              C
              C     THIS IS OFF-CENTER MASS.
              C
```

```
ISN 0104      2020 INP(NNPNEW) = NEWI(I)
ISN 0105           MNP(NNPNEW) = M
ISN 0106      2010 CONTINUE
ISN 0107           NNP = NNPNEW
              C
              C    CARDS 0300
              C
ISN 0108      2000 IF(NSP.EQ.0) GO TO 41
ISN 0110           NSPNEW = NSP
ISN 0111           DO 30 J=1,NSP
ISN 0112           I = II(J)
ISN 0113           K = KK(J)
ISN 0114           M = MM(J)
ISN 0115           IF(M.EQ.0) GO TO 2003
ISN 0117           DO 2004 JJ=1,NNP
ISN 0118           IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2005
ISN 0120      2004 CONTINUE
ISN 0121      2005 IF(NEWI(I).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 30
ISN 0123           GO TO 2006
ISN 0124      2003 IF(NEWI(I).EQ.0) GO TO 30
ISN 0126      2006 NSPNEW = NSPNEW+1
ISN 0127           II(NSPNEW) = NEWI(I)
ISN 0128           KK(NSPNEW) = K
ISN 0129           MM(NSPNEW) = M
ISN 0130           IF(M.EQ.0) GO TO 2007
ISN 0132           IF(NEWI(I).NE.0) GO TO 2007
ISN 0134           II(NSPNEW) = I
ISN 0135           MM(NSPNEW) = MNP(NEWNP(JJ))
ISN 0136      2007 XLBAR(NSPNEW) = XLBAR(J)
ISN 0137           IF(K.EQ.2) XLBAR(NSPNEW) = -XLBAR(NSPNEW)
ISN 0139           XMU(NSPNEW) = XMU(J)
ISN 0140           XKE(NSPNEW) = XKE(J)
ISN 0141           XMAX(NSPNEW) = XMAX(J)
ISN 0142           GFLEX(NSPNEW) = GFLEX(J)
              C
              C    CARDS 0400
              C
ISN 0143           SI(NSPNEW) = SI(J)
ISN 0144           SA(NSPNEW) = SA(J)
ISN 0145           SB(NSPNEW) = SB(J)
ISN 0146           SF(NSPNEW) = SF(J)
ISN 0147           FSPOI(NSPNEW) = FSPOI(J)
ISN 0148           FSPOF(NSPNEW) = FSPOF(J)
ISN 0149           CDAMP(NSPNEW)=CDAMP(J)
ISN 0150           FSPOP(NSPNEW)=FSPOP(J)
ISN 0151           SCP(NSPNEW)   =SCP(J)
ISN 0152           STEMP1(NSPNEW)=STEMP1(J)
ISN 0153           STEMP2(NSPNEW)=STEMP2(J)
ISN 0154           STEMP3(NSPNEW)=STEMP3(J)
ISN 0155           STEMP4(NSPNEW)=STEMP4(J)
ISN 0156           STEMP5(NSPNEW)=STEMP5(J)
ISN 0157        30 CONTINUE
ISN 0158           NSP = NSPNEW
```

```
ISN 0159       41 CONTINUE
            C
            C     CARDS 0500
            C
ISN 0160          IF(NB.EQ.0) GO TO 101
ISN 0162          DO 99 I=1,NB
ISN 0163          NEWIJ(I) = 0
ISN 0164       99 CONTINUE
ISN 0165          NBNEW = NB
ISN 0166          NBOLD = NB
ISN 0167          DO 50 K=1,NB
ISN 0168          I = IG(K)
ISN 0169          J = JG(K)
ISN 0170          M = MG(K)
ISN 0171          N = NG(K)
ISN 0172          IF(M .EQ. 0) GO TO 70
ISN 0174          DO 71 JJ=1, NNPOLD
ISN 0175          IF(I .NE. INP(JJ) .OR. M .NE. MNP(JJ)) GO TO 71
ISN 0177          IF(YNPDP(JJ) .EQ. 0.0) GO TO 72
ISN 0179          GO TO 51
ISN 0180       71 CONTINUE
ISN 0181          PRINT 2030
ISN 0182     2030 FORMAT(5X, '3. DATA ERROR IN GENMOD AT 2030')
ISN 0183          STOP
ISN 0184       70 IF(YDP(I) .NE. 0.0) GO TO 51
ISN 0186       72 IF(N .EQ. 0) GO TO 73
ISN 0188          DO 74 JJ=1, NNPOLD
ISN 0189          IF(J .NE. INP(JJ) .OR. N .NE. MNP(JJ)) GO TO 74
ISN 0191          IF(YNPDP(JJ) .EQ. 0.0) GO TO 50
ISN 0193          GO TO 90
ISN 0194       74 CONTINUE
ISN 0195          PRINT 2040
ISN 0196     2040 FORMAT(5X, '4. DATA ERROR IN GENMOC AT 2040')
ISN 0197          STOP
ISN 0198       73 IF(YDP(J) .EQ. 0.0) GO TO 50
ISN 0200          GO TO 90
ISN 0201       51 IF(J .NE. 0) GO TO 90
ISN 0203          JG(K) = NEWI(I)
ISN 0204          NG(K) = M
ISN 0205          GO TO 50
            C
            C     FOR ALL OTHER SITUATIONS, WE MUST ADD NEW BEAMS TO MODEL.
            C
ISN 0206       90 NBNEW = NBNEW+1
ISN 0207          NEWIJ(K) = NBNEW
ISN 0208          IF(YDP(I).EQ.0.OR.YDP(J).EQ.0.) GO TO 52
            C
            C     BOTH I AND J MASSES OFF AIRPLANE X-Z PLANE.
            C
ISN 0210          IG(NBNEW) = NEWI(I)
ISN 0211          JG(NBNEW) = NEWI(J)
ISN 0212          MG(NBNEW) = M
ISN 0213          NG(NBNEW) = N
```

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ISN 0214          GO TO 80
ISN 0215       52 ITEST = 0
ISN 0216          IF(YDP(I).EQ.0.) GO TO 53
            C
            C     MASS I IS OFF X-Z PLANE, J IS ON.
            C     GET NODE POINT NUMBER JN FOR MASS J.
            C
ISN 0218          IF(N.NE.0) GO TO 55
ISN 0220          MG(NBNEW) = 0
ISN 0221          GO TO 57
ISN 0222       55 DO 54 JN=1,NNP
ISN 0223          IF(INP(JN).EQ.J.AND.MNP(JN).EQ.N) GO TO 56
ISN 0225       54 CONTINUE
ISN 0226       56 MG(NBNEW) = N
ISN 0227          IF(NEWNP(JN).EQ.0) GO TO 57
ISN 0229          MG(NBNEW) = MNP(NEWNP(JN))
ISN 0230       57 NG(NBNEW) = M
ISN 0231          IG(NBNEW) = J
ISN 0232          JG(NBNEW) = NEWI(I)
ISN 0233          GO TO 80
ISN 0234       53 IF(YDP(J).EQ.0.) GO TO 59
            C
            C     MASS I IS ON X-Z PLANE, J IS OFF.
            C     GET NODE POINT NUMBER JM FOR MASS I.
            C
ISN 0236       60 IF(M.NE.0) GO TO 61
ISN 0238          MG(NBNEW) = 0
ISN 0239          GO TO 62
ISN 0240       61 DO 63 JM=1,NNP
ISN 0241          IF(INP(JM).EQ.I.AND.MNP(JM).EQ.M) GO TO 64
ISN 0243       63 CONTINUE
ISN 0244       64 MG(NBNEW) = M
ISN 0245          IF(NEWNP(JM).EQ.0) GO TO 62
ISN 0247          MG(NBNEW) = MNP(NEWNP(JM))
ISN 0248       62 IF(ITEST.NE.0) GO TO 58
ISN 0250          NG(NBNEW) = N
ISN 0251          IG(NBNEW) = I
ISN 0252          JG(NBNEW) = NEWI(J)
ISN 0253          GO TO 80
            C
            C     BOTH MASSES I AND J ARE ON X-Z PLANE.
            C
ISN 0254       59 ITEST = 1
ISN 0255          IG(NBNEW) = I
ISN 0256          JG(NBNEW) = J
ISN 0257          GO TO 60
ISN 0258       58 IF(N.NE.0) GO TO 150
ISN 0260          NG(NBNEW) = 0
ISN 0261          GO TO 80
ISN 0262      150 DO 151 JN=1,NNP
ISN 0263          IF(INP(JN).EQ.J.AND.MNP(JN).EQ.N) GO TO 152
ISN 0265      151 CONTINUE
ISN 0266      152 NG(NBNEW) = N
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ISN 0267          IF(NEWNP(JN).EQ.0) GO TO 80                                  00003060
ISN 0269          NG(NBNEW) = MNP(NEWNP(JN))                                   00003070
            C                                                                  00003080
            C     ALL ABOVE STUFF GETS I,J,M AND N FOR NEW BEAM.               00003090
            C     NOW SET ITS PARAMETERS EQUAL TO THOSE FOR ITS TWIN.          00003100
            C                                                                  00003110
ISN 0270       80 MC(NBNEW) = MC(K)                                            00003120
ISN 0271          AA(NBNEW) = AA(K)                                            00003130
ISN 0272          YY(NBNEW) = YY(K)                                            00003140
ISN 0273          ZZ(NBNEW) = ZZ(K)                                            00003150
ISN 0274          XJ(NBNEW) = XJ(K)                                            00003160
ISN 0275          Z1(NBNEW) = Z1(K)                                            00003170
ISN 0276          Z2(NBNEW) = Z2(K)                                            00003180
ISN 0277          XIQ(NBNEW)=XIQ(K)                                            00003190
ISN 0278          PY(NBNEW) = PY(K)                                            00003200
ISN 0279          PYJ(NBNEW)=PYJ(K)                                            00003210
ISN 0280          PZ(NBNEW) = PZ(K)                                            00003220
ISN 0281          PZJ(NBNEW)=PZJ(K)                                            00003230
ISN 0282          SF26(NBNEW)=SF26(K)                                          00003240
ISN 0283          SF35(NBNEW)=SF35(K)                                          00003250
ISN 0284          SF26J(NBNEW)=SF26J(K)                                        00003260
ISN 0285          SF35J(NBNEW)=SF35J(K)                                        00003270
ISN 0286          CBAR(NBNEW) = CBAR(K)                                        00003280
ISN 0287          IJPR(NBNEW) = 0                                              00003290
ISN 0288          IJUB(NBNEW)=IJUB(K)                                          00003300
ISN 0289          DB(NBNEW)=DB(K)                                              00003310
ISN 0290       50 CONTINUE                                                     00003320
ISN 0291          NB = NBNEW                                                   00003330
ISN 0292      101 CONTINUE                                                     00003340
            C                                                                  00003350
            C     CARDS 0601 AND UP                                            00003360
            C                                                                  00003370
ISN 0293          IF(ND.EQ.0) GO TO 102                                        00003380
ISN 0295          CDUM = .01                                                   00003390
ISN 0296          IF(DAMPC.NE.0.) CDUM = DAMPC                                 00003400
ISN 0298          ND = 0                                                       00003410
ISN 0299          DO 103 IJ=1,NB                                               00003420
ISN 0300          IF(CBAR(IJ).EQ.CDUM) GO TO 103                               00003430
ISN 0302          ND = ND+1                                                    00003440
ISN 0303      103 CONTINUE                                                     00003450
ISN 0304      102 CONTINUE                                                     00003460
ISN 0305          IF(NOLEO.EQ.0.) GO TO 709                                    00003470
ISN 0307          NOLEON=NOLEO                                                 00003480
ISN 0308          DO 701 J=1,NOLEO                                             00003490
ISN 0309          DO 702 IJ=1,NBOLD                                            00003500
ISN 0310          IF(IGOLEO(J).EQ. IG(IJ).AND.JGOLEO(J).EQ. JG(IJ).AND.MGOLEO(J)  00003510
                 1.EQ.MG(IJ).AND. NGOLEO(J).EQ.NG(IJ)) GO TO 703               00003520
ISN 0312      702 CONTINUE                                                     00003530
ISN 0313      703 IF(NEWIJ(IJ).EQ.0) GO TO 701                                 00003540
ISN 0315          JI=NEWIJ(IJ)                                                 00003550
ISN 0316          NOLEON=NOLEON+1                                              00003560
ISN 0317          IGOLEO(NOLEON)=IG(JI)                                        00003570
ISN 0318          JGOLEO(NOLEON)=JG(JI)                                        00003580
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ISN 0319          MGOLEO(NOLEON)=MG(JI)                                         00003590
ISN 0320          NGOLEO(NOLEON)=NG(JI)                                         00003600
ISN 0321          EOLEO(NOLEON)=EOLEO(J)                                        00003610
ISN 0322          FAO(NOLEON)=FAO(J)                                            00003620
ISN 0323          FAA(NOLEON)=FAA(J)                                            00003630
ISN 0324          EXPOLE(NOLEON)=EXPOLE(J)                                      00003640
ISN 0325          YMAX(NOLEON)=YMAX(J)                                          00003650
ISN 0326          BOLEO(NOLEON)=BOLEO(J)                                        00003660
ISN 0327          BROLEO(NOLEON)=BROLEO(J)                                      00003670
ISN 0328          XKEXT(NOLEON)=XKEXT(J)                                        00003680
ISN 0329          XKCOMP(NOLEON)=XKCOMP(J)                                      00003690
ISN 0330          FCOUL(NOLEON)=FCOUL(J)                                        00003700
ISN 0331      701 CONTINUE                                                      00003710
ISN 0332          NOLEO=NOLEON                                                  00003720
ISN 0333      709 CONTINUE                                                      00003730
            C                                                                   00003740
            C     CARDS 0700                                                    00003750
            C                                                                   00003760
ISN 0334          IF(NLB.EQ.0) GO TO 250                                        00003770
            C                                                                   00003780
            C     SEARCH NONLINEAR BEAM SPECIFICATION TABLE (CARDS 0701 TO 0700+NLB)00003790
            C     TO DETERMINE WHICH NEW ELEMENTS ARE TO BE ADDED.              00003800
            C                                                                   00003810
ISN 0336          DO 240 K=1,180                                                00003820
ISN 0337          OLDNLB(K) = 0                                                 00003830
ISN 0338      240 CONTINUE                                                      00003840
ISN 0339          NLBOLD = NLB                                                  00003850
ISN 0340          NLBNEW = NLB                                                  00003860
ISN 0341          DO 200 K=1,NLBOLD                                             00003870
ISN 0342          I = IQ(K)                                                     00003880
ISN 0343          J = JQ(K)                                                     00003890
ISN 0344          M = MQ(K)                                                     00003900
ISN 0345          N = NQ(K)                                                     00003910
            C                                                                   00003920
            C     IF J.EQ.0 IN OLD TABLE,CHANGE IT TO NEWI(I) FOR BIG MODEL     00003930
            C     TO AGREE WITH NEW BEAM NUMBERING.                             00003940
            C                                                                   00003950
ISN 0346          IF(J.EQ.0) J = NEWI(I)                                        00003960
ISN 0348          DO 210 IJ=1,NBOLD                                             00003970
ISN 0349          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) 00003980
                 1 GO TO 220                                                    00003990
ISN 0351      210 CONTINUE                                                      00004000
ISN 0352      220 IF(NEWIJ(IJ).EQ.0) GO TO 200                                  00004010
            C                                                                   00004020
            C     IF THERE IS A NEW BEAM CORRESPONDING TO THE OLD ONE,INCREMENT 00004030
            C     THE NLBNEW COUNTER AND SET THE NEW TABLE PARAMETERS EQUAL TO  00004040
            C     THE OLD VALUES EXCEPTING THE IJ IDENTIFICATION,OTHERWISE BYPASS. 00004050
            C                                                                   00004060
ISN 0354          NLBNEW = NLBNEW+1                                             00004070
ISN 0355          IQ(NLBNEW) = IG(NEWIJ(IJ))                                    00004080
ISN 0356          JQ(NLBNEW) = JG(NEWIJ(IJ))                                    00004090
ISN 0357          MQ(NLBNEW) = MG(NEWIJ(IJ))                                    00004100
ISN 0358          NQ(NLBNEW) = NG(NEWIJ(IJ))                                    00004110
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ISN 0359          LQ(NLBNEW) = LQ(K)                                         00004120
ISN 0360          NPQ(NLBNEW) = NPQ(K)                                       00004130
ISN 0361          LDP(NLBNEW) = LDP(K)                                       00004140
ISN 0362          LDP1(NLBNEW) = LDP1(K)                                     00004150
            C                                                                00004160
            C     NOW CALCULATE IJSAVE AND NLSFLG FOR THE NEW BEAM(S) AND SET    00004170
            C     UP VECTORS SHOWING CORRESPONDENCE BETWEEN OLD AND NEW NONLINEAR 00004180
            C     BEAM TABLE NUMBERS.                                        00004190
            C                                                                00004200
ISN 0363          IJSAVE(NLBNEW) = NEWIJ(IJ)                                 00004210
ISN 0364          NLSFLG(6*(NEWIJ(IJ)-1)+LQ(K)) = NLBNEW                     00004220
ISN 0365          OLDNLB(NLBNEW) = K                                         00004230
ISN 0366      200 CONTINUE                                                   00004240
ISN 0367          NLB = NLBNEW                                               00004250
            C                                                                00004260
            C     CARDS 0800                                                 00004270
            C                                                                00004280
            C                                                                00004290
            C     NOW WE MUST SEARCH ALL THE NEW KR TABLE SPECS TO SEE IF ANY    00004300
            C     REQUIRE DIRECT INPUT ON CARDS 0801-08XX FOR NP.GT.9.IF SO,     00004310
            C     WE MUST FILL THE KR AND XKR TABLES FROM NLBOLD WHICH WAS DONE  00004320
            C     IN INPUT TO THE NEW VALUE NLBNEW.                          00004330
            C                                                                00004340
ISN 0368          NLBOP1 = NLBOLD+1                                          00004350
ISN 0369          DO 230 I=NLBOP1,NLBNEW                                     00004360
ISN 0370          NP = NPQ(I)                                                00004370
ISN 0371          IF(NP.LT.10) GO TO 230                                     00004380
ISN 0373          ICH = (I-1)*15                                             00004390
ISN 0374          OLDICH = (OLDNLB(I)-1)*15                                  00004400
ISN 0375          DO 241 J=1,NP                                              00004410
ISN 0376          XKR(ICH+J) = XKR(OLDICH+J)                                 00004420
ISN 0377          KR(ICH+J) = KR(OLDICH+J)                                   00004430
ISN 0378      241 CONTINUE                                                   00004440
ISN 0379      230 CONTINUE                                                   00004450
ISN 0380      250 CONTINUE                                                   00004460
            C                                                                00004470
            C     CARDS 1000                                                 00004480
            C                                                                00004490
            C     DELETED OLD INPUT SELECTED STRESS BEAMS 1000 CARDS         00004500
            C                                                                00004510
            C     CARDS 1101 AND UP                                          00004520
            C                                                                00004530
ISN 0381          IF(NDRI.EQ.0) GO TO 340                                    00004540
ISN 0383          NDRINW = NDRI                                              00004550
ISN 0384          DO 330 IJ=1,NBOLD                                          00004560
ISN 0385            IF(IJPR(IJ).NE.1.OR.NEWIJ(IJ).EQ.0) GO TO 330            00004570
ISN 0387          NDRINW = NDRINW+1                                          00004580
ISN 0388          IJPR(NEWIJ(IJ)) = 1                                        00004590
ISN 0389          IJPRT(2*NDRINW-1) = IG(NEWIJ(IJ))                          00004600
ISN 0390          IJPRT(2*NDRINW) = JG(NEWIJ(IJ))                            00004610
ISN 0391          IJPRT(2*NDRINW-1) = IG(NEWIJ(IJ))                          00004620
ISN 0392          IJPRT(2*NDRINW) = JG(NEWIJ(IJ))                            00004630
ISN 0393      330 CONTINUE                                                   00004640
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ISN 0394          NDRI = NDRINW                                              00004650
ISN 0395      340 CONTINUE                                                   00004660
            C                                                                00004670
            C     CARDS 1200                                                 00004680
            C                                                                00004690
ISN 0396          IF(NVCH.EQ.0) GO TO 360                                    00004700
            C                                                                00004710
            C     SET EVEN NUMBERED CORNER MASS NUMBERS EQUAL TO NEW MASSES  00004720
            C     ACROSS FROM ODD NUMBERED CORNER MASSES.                    00004730
            C                                                                00004740
ISN 0398          DO 380 I=1,NVCH                                            00004750
ISN 0399          DO 370 K=2,8,2                                             00004760
ISN 0400          INBUFF(I,K) = NEWI(INBUFF(I,K-1))                          00004770
ISN 0401      370 CONTINUE                                                   00004780
ISN 0402      380 CONTINUE                                                   00004790
ISN 0403      360 CONTINUE                                                   00004800
            C                                                                00004810
            C     CARDS 1300                                                 00004820
            C                                                                00004830
ISN 0404          IF(NVBM.EQ.0) GO TO 450                                    00004840
ISN 0406          NVBMNW = NVBM                                              00004850
ISN 0407          DO 410 JI=1,NVBM                                           00004860
ISN 0408          IF(JG(IJVM(JI)).EQ.0) JG(IJVM(JI)) = NEWI(IG(IJVM(JI)))    00004870
ISN 0410          I = IG(IJVM(JI))                                           00004880
ISN 0411          J = JG(IJVM(JI))                                           00004890
ISN 0412          M = MG(IJVM(JI))                                           00004900
ISN 0413          N = NG(IJVM(JI))                                           00004910
ISN 0414          DO 420 IJ=1,NBOLD                                          00004920
ISN 0415          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00004930
                 1 GO TO 430                                                 00004940
ISN 0417      420 CONTINUE                                                   00004950
ISN 0418      430 IF(NEWIJ(IJ).EQ.0) GO TO 410                               00004960
ISN 0420          NVBMNW = NVBMNW+1                                          00004970
ISN 0421          IJVM(NVBMNW) = NEWIJ(IJ)                                   00004980
ISN 0422          DO 440 L=1,6                                               00004990
ISN 0423          VMAX2(L,NEWIJ(IJ)) = VMAX2(L,IJ)                           00005000
ISN 0424      440 CONTINUE                                                   00005010
ISN 0425      410 CONTINUE                                                   00005020
ISN 0426          NVBM = NVBMNW                                              00005030
ISN 0427      450 CONTINUE                                                   00005040
ISN 0428          IF(NVBMN.EQ.0) GO TO 460                                   00005050
ISN 0430          NVBMNW=NVBMN                                               00005060
ISN 0431          DO 461 JI=1,NVBMN                                          00005070
ISN 0432          IF(JG(IJVMN(JI)).EQ.0) JG(IJVMN(JI))=NEWI(IG(IJVMN(JI)))   00005080
ISN 0434          I=IG(IJVMN(JI))                                            00005090
ISN 0435          J=JG(IJVMN(JI))                                            00005100
ISN 0436          M=MG(IJVMN(JI))                                            00005110
ISN 0437          N=NG(IJVMN(JI))                                            00005120
ISN 0438          DO 462  IJ=1,NBOLD                                         00005130
ISN 0439          IF (I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00005140
                 1 GO TO 463                                                 00005150
ISN 0441      462 CONTINUE                                                   00005160
ISN 0442      463 IF(NEWIJ(IJ).EQ.0) GO TO 461                               00005170
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ISN 0444          NVBMNW=NVBMNW+1                                                 00005180
ISN 0445          IJVMN(NVBMNW)=NEWIJ(IJ)                                         00005190
ISN 0446          DO 465 L=1,6                                                    00005200
ISN 0447          VMAX3(L,NEWIJ(IJ))=VMAX3(L,IJ)                                  00005210
ISN 0448      465 CONTINUE                                                        00005220
ISN 0449      461 CONTINUE                                                        00005230
ISN 0450          NVBMN=NVBMNW                                                    00005240
ISN 0451      460 CONTINUE                                                        00005250
ISN 0452          IF(NFBM.EQ.0) GO TO 400                                         00005260
ISN 0454          NFBMNW=NFBM                                                     00005270
ISN 0455          DO 451 JI=1,NFBM                                                00005280
ISN 0456          IF(JG(IJFM(JI)).EQ.0) JG(IJFM(JI)) = NEWI(IG(IJFM(JI)))        00005290
ISN 0458          I = IG(IJFM(JI))                                                00005300
ISN 0459          J = JG(IJFM(JI))                                                00005310
ISN 0460          M = MG(IJFM(JI))                                                00005320
ISN 0461          N = NG(IJFM(JI))                                                00005330
ISN 0462          DO 452 IJ=1,NBOLD                                               00005340
ISN 0463          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).                00005350
                 1AND.N.EQ.NG(IJ)) GO TO 453                                      00005360
ISN 0465      452 CONTINUE                                                        00005370
ISN 0466      453 IF(NEWIJ(IJ).EQ.0) GO TO 451                                    00005380
ISN 0468          NFBMNW=NFBMNW+1                                                 00005390
ISN 0469          IJFM(NFBMNW) = NEWIJ(IJ)                                        00005400
ISN 0470          DO 455 L=1,6                                                    00005410
ISN 0471          FMAX2(L,NEWIJ(IJ))=FMAX2(L,IJ)                                  00005420
ISN 0472      455 CONTINUE                                                        00005430
ISN 0473      451 CONTINUE                                                        00005440
ISN 0474          NFBM=NFBMNW                                                     00005450
ISN 0475      400 CONTINUE                                                        00005460
ISN 0476          IF(NFBMN.EQ.0) GO TO 470                                        00005470
ISN 0478          NFBMNW=NFBMN                                                    00005480
ISN 0479          DO 471 JI=1,NFBMN                                               00005490
ISN 0480          IF(JG(IJFMN(JI)).EQ.0) JG(IJFMN(JI))=NEWI(IG(IJFMN(JI)))       00005500
ISN 0482          I=IG(IJFMN(JI))                                                 00005510
ISN 0483          J=JG(IJFMN(JI))                                                 00005520
ISN 0484          M=MG(IJFMN(JI))                                                 00005530
ISN 0485          N=NG(IJFMN(JI))                                                 00005540
ISN 0486          DO 472 IJ=1,NBOLD                                               00005550
ISN 0487          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) 00005560
                 1 GO TO 473                                                      00005570
ISN 0489      472 CONTINUE                                                        00005580
ISN 0490      473 IF(NEWIJ(IJ).EQ.0) GO TO 471                                    00005590
ISN 0492          NFBMNW=NFBMNW+1                                                 00005600
ISN 0493          IJFMN(NFBMNW)=NEWIJ(IJ)                                         00005610
ISN 0494          DO 475 L=1,6                                                    00005620
ISN 0495          FMAX3(L,NEWIJ(IJ))=FMAX3(L,IJ)                                  00005630
ISN 0496      475 CONTINUE                                                        00005640
ISN 0497      471 CONTINUE                                                        00005650
ISN 0498          NFBMN=NFBMNW                                                    00005660
ISN 0499      470 CONTINUE                                                        00005670
             C                                                                    00005680
ISN 0500          LL=0                                                            00005690
ISN 0501          L=KOUNT                                                         00005700
```

```
ISN 0502          IF(NACC.EQ.0) GO TO 490                                    00005710
ISN 0504          NACNEW=NACC                                                00005720
ISN 0505          DO 476 K=1,NACC                                            00005730
ISN 0506          I=MASSNO(K)                                                00005740
ISN 0507          IF(NEWI(I).EQ.0) GO TO 491                                 00005750
ISN 0509          NACNEW=NACNEW+1                                            00005760
ISN 0510          IN=NEWI(I)                                                 00005770
ISN 0511          MASSNO(NACNEW)=IN                                          00005780
ISN 0512          DIR(NACNEW)=DIR(K)                                         00005790
ISN 0513          NPTS(NACNEW)=NPTS(K)                                       00005800
ISN 0514          JAY(NACNEW,1)=NACNEW                                       00005810
ISN 0515          JJ=NPTS(K)                                                 00005820
ISN 0516          DO 477 JK=1,JJ                                             00005830
ISN 0517          L=L+1                                                      00005840
ISN 0518          LL=LL+1                                                    00005850
ISN 0519          TIM(L)=TIM(LL)                                             00005860
ISN 0520          ACCEL(L)=ACCEL(LL)                                         00005870
ISN 0521      477 CONTINUE                                                   00005880
ISN 0522          KOUNT=KOUNT+NPTS(K)                                        00005890
ISN 0523          IF(KOUNT.GT.300) GO TO 478                                 00005900
ISN 0525      491 CONTINUE                                                   00005910
ISN 0526          NACC=NACNEW                                                00005920
ISN 0527      476 CONTINUE                                                   00005930
ISN 0528          GO TO 490                                                  00005940
ISN 0529      478 PRINT 479,NACC,KOUNT                                       00005950
ISN 0530      479 FORMAT(1X,'7.ERROR IN ACCEL TIME DATA INPUT'/1X,'NUMACL,KOUNT=',   00005960
                 1 2I5)                                                      00005970
ISN 0531      490 CONTINUE                                                   00005980
            C     CARDS 1400                                                 00005990
            C                                                                00006000
ISN 0532          IF(NHI.EQ.0) GO TO 500                                     00006010
ISN 0534          NHINEW = NHI                                               00006020
ISN 0535          DO 510 K=1,NHI                                             00006030
ISN 0536          I = INBUF(K)                                               00006040
ISN 0537          IF(NEWI(I).EQ.0) GO TO 510                                 00006050
ISN 0539          NHINEW = NHINEW+1                                          00006060
ISN 0540          IN = NEWI(I)                                               00006070
ISN 0541          INBUF(NHINEW) = IN                                         00006080
ISN 0542          ALIFT(IN) = ALIFT(I)                                       00006090
ISN 0543          HEX(IN) = HEX(I)                                           00006100
ISN 0544          HEY(IN) = HEY(I)                                           00006110
ISN 0545          HEZ(IN) = HEZ(I)                                           00006120
ISN 0546          XYI(IN) = XYI(I)                                           00006130
ISN 0547          YZI(IN) = YZI(I)                                           00006140
ISN 0548          XZI(IN) = XZI(I)                                           00006150
ISN 0549      510 CONTINUE                                                   00006160
ISN 0550          NHI = NHINEW                                               00006170
ISN 0551      500 CONTINUE                                                   00006180
            C                                                                00006190
            C     CARDS 1500                                                 00006200
            C                                                                00006210
ISN 0552          IF(NPH.EQ.0) GO TO 530                                     00006220
ISN 0554          NPHNEW = NPH                                               00006230
```

```
ISN 0555          DO 540 J=1,NPH
ISN 0556          I = IPHDP(J)
ISN 0557          IF(NEWI(I).EQ.0) GO TO 540
ISN 0559          NPHNEW = NPHNEW+1
ISN 0560          IN = NEWI(I)
ISN 0561          PHIDP(IN) = -PHIDP(I)
ISN 0562          THEDP(IN) =  THEDP(I)
ISN 0563          PSIDP(IN) = -PSIDP(I)
ISN 0564          IPHDP(NPHNEW) = IN
ISN 0565      540 CONTINUE
ISN 0566          NPH = NPHNEW
            C
            C     CARDS 1600
            C
ISN 0567          DO 570 IJ=1,NBOLD
ISN 0568          IF(NEWIJ(IJ).EQ.0) GO TO 570
ISN 0570          IJN = NEWIJ(IJ)
ISN 0571          PHIIJ(IJN) = -PHIIJ(IJ)
ISN 0572          THEIJ(IJN) =  THEIJ(IJ)
ISN 0573          PSIIJ(IJN) = -PSIIJ(IJ)
ISN 0574      570 CONTINUE
ISN 0575      530 CONTINUE
            C
            C     CARDS 2100
            C
ISN 0576          IF(NKM.EQ.0) GO TO 600
ISN 0578          NKMNEW = NKM
ISN 0579          DO 610 IJ=1,NBOLD
ISN 0580          IF(NKMVEC(IJ).EQ.0.OR.NEWIJ(IJ).EQ.0) GO TO 610
ISN 0582          NKMNEW = NKMNEW+1
ISN 0583          IJN = NEWIJ(IJ)
ISN 0584          NKMVEC(IJN) = 1
ISN 0585          DO 620 K=1,6
ISN 0586          DO 620 L=1,6
ISN 0587          XK3(L,K,IJN) = XK3(L,K,IJ)
ISN 0588      620 CONTINUE
ISN 0589      610 CONTINUE
ISN 0590          NKM = NKMNEW
ISN 0591      600 CONTINUE
ISN 0592          IF(PUNMOD.EQ.0) GO TO 700
ISN 0594          IPUNCH = 7
            C
            C     CARD 0001,0002
            C
ISN 0595          WRITE(IPUNCH,1000) TITLE
            C
            C     CARD 0003
            C
ISN 0596          WRITE(IPUNCH,1010) NM,NSP,NB,NLB,NS,MVP,NVCH,NDRI,NPL,NACC,NVBM,
                 1 NHI,NPH,ND
            C
            C     CARD 0004
            C
```

```
ISN 0597          WRITE(IPUNCH,1020) IPRINT,DELTAT,TMAX,PLOWT,RUNMOD,NKM
            C
            C     CARD 0005
            C
ISN 0598          LINE = 005
ISN 0599          WRITE(IPUNCH,1030) XGDOT,YGDOT,ZGDOT,LINE
            C
            C     CARD 0006
            C
ISN 0600          LINE = 006
ISN 0601          WRITE(IPUNCH,1030) PPR,QPR,RPR,LINE
            C
            C     CARD 0007
            C
ISN 0602          LINE = 007
ISN 0603          WRITE(IPUNCH,1040) PHIPR,THEPR,PSIPR,XGIN,ZGIN,BETA,LINE
            C
            C     CARDS 0100
            C
ISN 0604          LINE = 101
ISN 0605          DO 900 I=1,NM
ISN 0606          WRITE(IPUNCH,1050) WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),
                 1 LINE
ISN 0607          LINE = LINE+1
ISN 0608      900 CONTINUE
            C
            C     CARDS 0200
            C
ISN 0609          IF(NNP.EQ.0) GO TO 904
ISN 0611          LINE = 201
ISN 0612          WRITE(IPUNCH,1055) (MNP(I),INP(I),XNPDP(I),YNPDP(I),ZNPDP(I),
                 1 I=1,NNP),LINE
            C
            C     CARDS 0300
            C
ISN 0613      904 LINE = 301
ISN 0614          DO 905 J=1,NSP
ISN 0615          WRITE(IPUNCH,1060) MM(J),II(J),KK(J),XLBAR(J),XMU(J),XKE(J),
                 1 XMAX(J),LINE
ISN 0616          LINE = LINE+1
ISN 0617      905 CONTINUE
            C
            C     CARDS 0400
            C
ISN 0618          LINE = 401
ISN 0619          DO 910 J=1,NSP
ISN 0620          WRITE(IPUNCH,1040) SI(J),SA(J),SB(J),SF(J),FSPOI(J),FSPOF(J),
                 1 LINE
ISN 0621          LINE = LINE+1
ISN 0622      910 CONTINUE
            C
            C     CARDS 0500
            C
```

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ISN 0623          LINE = 501                                                    00007300
ISN 0624          DO 915 I=1,NB                                                 00007310
ISN 0625          WRITE(IPUNCH,1070) MG(I),IG(I),NG(I),JG(I),E(I),AA(I),G(I),   00007320
                 1 YY(I),ZZ(I),PY(I),PZ(I),LINE                                 00007330
ISN 0626          LINE = LINE+1                                                 00007340
ISN 0627      915 CONTINUE                                                      00007350
            C                                                                   00007360
            C     CARD 0600                                                     00007370
            C                                                                   00007380
ISN 0628          WRITE(IPUNCH,1080) DAMPC                                      00007390
            C                                                                   00007400
            C     CARDS 0601 AND UP                                             00007410
            C                                                                   00007420
ISN 0629          LINE = 601                                                    00007430
ISN 0630          DO 920 IJ=1,NB                                                00007440
ISN 0631          WRITE(IPUNCH,1090) MG(IJ),IG(IJ),NG(IJ),JG(IJ),CBAR(IJ),LINE  00007450
ISN 0632          LINE = LINE+1                                                 00007460
ISN 0633      920 CONTINUE                                                      00007470
            C                                                                   00007480
            C     CARDS 0700                                                    00007490
            C                                                                   00007500
            C                                                                   00007510
            C     CARDS 0800                                                    00007520
            C                                                                   00007530
            C                                                                   00007540
            C     CARDS 1000                                                    00007550
            C                                                                   00007560
            C                                                                   00007570
            C     CARD 1100                                                     00007580
            C                                                                   00007590
            C                                                                   00007600
            C     CARDS 1101 AND UP                                             00007610
            C                                                                   00007620
            C                                                                   00007630
            C     CARDS 1200                                                    00007640
            C                                                                   00007650
            C                                                                   00007660
            C     CARDS 1300                                                    00007670
            C                                                                   00007680
            C                                                                   00007690
            C     CARDS 1400                                                    00007700
            C                                                                   00007710
            C                                                                   00007720
            C     CARDS 1500                                                    00007730
            C                                                                   00007740
            C                                                                   00007750
            C     CARDS 1600                                                    00007760
            C                                                                   00007770
            C                                                                   00007780
            C     CARDS 1700,1800                                               00007790
            C                                                                   00007800
            C                                                                   00007810
            C     CARDS 2000                                                    00007820
```

```
                C                                                     00007830
                C                                                     00007840
                C     CARDS 2100                                      00007850
                C                                                     00007860
ISN 0634         1000 FORMAT(20A4)                                    00007870
ISN 0635         1010 FORMAT(14I5,7X,'003')                           00007880
ISN 0636         1020 FORMAT(I10,1P3E10.3,20X,F5.1,I5,7X,'004')       00007890
ISN 0637         1030 FORMAT(1P3E10.3,46X,I4)                         00007900
ISN 0638         1040 FORMAT(1P6E10.3,16X,I4)                         00007910
ISN 0639         1050 FORMAT(1P7E10.3,6X,I4)                          00007920
ISN 0640         1055 FORMAT(2I5,1P3E10.3,36X,I4)                     00007930
ISN 0641         1060 FORMAT(3I5,1P4E10.3,21X,I4)                     00007940
ISN 0642         1070 FORMAT(2(I2,I3),1P5E10.3,2I5,6X,I4)             00007950
ISN 0643         1080 FORMAT(1PE10.3,67X,'600')                       00007960
ISN 0644         1090 FORMAT(4I5,1PE10.3,46X,I4)                      00007970
ISN 0645          700 RETURN                                          00007980
ISN 0646              END                                             00007990
```

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**************************************************************************************
*                                                                                    *
*                                                                                    *
*                                                                                    *
*                                                                                    *
*                                                                                    *
*          LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.              *
*                                                                                    *
**************************************************************************************

      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                C          DATA SET D2334IC     AT LEVEL 003 AS OF 06/25/79
                C          DATA SET D2332NIC    AT LEVEL 007 AS OF 12/01/77          00000010
                C          DATA SET D2332NIC    AT LEVEL 005 AS OF 11/04/77          00000020
                C          DATA SET D2332MIC    AT LEVEL 002 AS OF 09/02/77          00000030
  ISN 0002             SUBROUTINE IC                                                 00000040
                C                                                                    00000050
  ISN 0003             IMPLICIT REAL*8 (A-H,O-Z)                                     00000060
  ISN 0004             REAL*8 KUN                                                    00000070
  ISN 0005             REAL*4 CLTEST                                                 00000080
  ISN 0006             INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                   00000090
  ISN 0007             INTEGER*4 TITLE(40)                                           00000100
  ISN 0008             INTEGER*2 N1,NN                                               00000110
  ISN 0009             INTEGER*2 INBUFF                                              00000120
  ISN 0010             INTEGER*2 IJPR,IG,JG                                          00000130
  ISN 0011             INTEGER*2 II(40),KK(40),MM(40),MG(150),NG(150),INP(50),MNP(50) 00000140
  ISN 0012             DIMENSION XMPR(3),ABARPR(3,3),ANGDPR(3),DPR(3,3),AIDP(3,3),   00000150
                     1 AIC(3,3),ADPR(3,3),VJP(80,3),APR(3,3),VIP(3),XV(3)            00000160
  ISN 0013             DIMENSION XK3(6,6,150),YZMIN(150)                             00000170
  ISN 0014             DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)  00000180
  ISN 0015             DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)  00000190
  ISN 0016             DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)00000200
  ISN 0017             DIMENSION IMDRI(80)                                           00000210
  ISN 0018             COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),       00000220
                     1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150), 00000230
                     2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                  00000240
  ISN 0019             COMMON/CFIC/ SINBET,COSBET,ABETA(9)                           00000250
  ISN 0020             COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),   00000260
                     1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)       00000270
  ISN 0021             COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),             00000280
                     1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,            00000290
                     2 XGDOT,YGDOT,ZGDOT                                             00000300
  ISN 0022             COMMON/INIDCP/ YDP(80)                                        00000310
  ISN 0023             COMMON/INCFIC/ BETA                                           00000320
  ISN 0024             COMMON/INPR/ NDRI,NSP                                         00000330
  ISN 0025             COMMON/MCFIII/ SYMFLG                                         00000340
  ISN 0026             COMMON/NP00I2/ MG,NG,INP,MNP                                  00000350
  ISN 0027             COMMON/NP01I2/ II,KK,MM                                       00000360
  ISN 0028             COMMON/NP00I4/ NNP                                            00000370
  ISN 0029             COMMON/NP00R8/ RX,RY,RZ                                       00000380
  ISN 0030             COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,        00000390
                     1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                     00000400
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AD-A055 898 LOCKHEED-CALIFORNIA CO BURBANK F/G 1/2
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FEB 78 M A GAMON DOT-FA75WA-3707
UNCLASSIFIED LR-28307-VOL-1 FAA/RD-77/189-VOL-1 NL

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ISN 0031      COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                  00000410
ISN 0032      COMMON/OLEO/ EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),       00000420
             1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),  00000430
             2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO         00000440
ISN 0033      COMMON/DEIC/ WTOT,CLTEST(150)                                     00000450
ISN 0034      COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000460
             1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),           00000470
             2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),           00000480
             3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),    00000490
             4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80), 00000500
             5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT, 00000510
             6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                             00000520
             7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,             00000530
             8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),           00000540
             9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),         00000550
             A CEIKF(40),                                                       00000560
             B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                            00000570
             C NM,NB,I,J,IG(150),JG(150),                                       00000580
             D N1(900),NN(40),IJFR(150)                                         00000590
ISN 0035      COMMON/IPIC/ NIC                                                  00000600
ISN 0036      EQUIVALENCE (PPR,XMPR(1)),(QPR,XMPR(2)),(RPR,XMPR(3)),            00000610
             1  (PHIDPR,ANGDPR(1)),(THEDPR,ANGDPR(2)),(PSIDPR,ANGDPR(3))        00000620
ISN 0037      EQUIVALENCE (XK(1),XK3(1,1,1))                                    00000630
ISN 0038      SIN(X) = DSIN(X)                                                  00000640
ISN 0039      COS(X) = DCOS(X)                                                  00000650
ISN 0040      SQRT(X) = DSQRT(X)                                                00000660
ISN 0041      ARSIN(X) = DARSIN(X)                                              00000670
ISN 0042      ATAN2(Y,X) = DATAN2(Y,X)                                          00000680
ISN 0043      AMIN1(X,Y) = DMIN1(X,Y)                                           00000690
ISN 0044      ABS(X)=DABS(X)                                                    00000700
ISN 0045      WTOT = 0.0                                                        00000710
ISN 0046      PI = 3.14159265358979324D0                                        00000720
ISN 0047      PI2 = PI/2.                                                       00000730
ISN 0048      PIN = -PI                                                         00000740
ISN 0049      PI2N = -PI2                                                       00000750
ISN 0050      BETAR = BETA*PI/180.                                              00000760
ISN 0051      SINBET = DSIN(BETAR)                                              00000770
ISN 0052      COSBET = DCOS(BETAR)                                              00000780
ISN 0053      ABETA(1) = COSBET                                                 00000790
ISN 0054      ABETA(2) = 0.                                                     00000800
ISN 0055      ABETA(3) =-SINBET                                                 00000810
ISN 0056      ABETA(4) = 0.                                                     00000820
ISN 0057      ABETA(5) = 1.                                                     00000830
ISN 0058      ABETA(6) = 0.                                                     00000840
ISN 0059      ABETA(7) = SINBET                                                 00000850
ISN 0060      ABETA(8) = 0.                                                     00000860
ISN 0061      ABETA(9) = COSBET                                                 00000870
ISN 0062      KMATR(1,1) = 3                                                    00000880
ISN 0063      KMATR(1,2) = 4                                                    00000890
ISN 0064      KMATR(1,3) = 7                                                    00000900
ISN 0065      KMATR(1,4) = 8                                                    00000910
ISN 0066      KMATR(2,1) = 1                                                    00000920
ISN 0067      KMATR(2,2) = 2                                                    00000930
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ISN 0068          KMATR(2,3) = 5                                          00000940
ISN 0069          KMATR(2,4) = 6                                          00000950
ISN 0070          KMATR(3,1) = 1                                          00000960
ISN 0071          KMATR(3,2) = 3                                          00000970
ISN 0072          KMATR(3,3) = 5                                          00000980
ISN 0073          KMATR(3,4) = 7                                          00000990
ISN 0074          KMATR(4,1) = 2                                          00001000
ISN 0075          KMATR(4,2) = 4                                          00001010
ISN 0076          KMATR(4,3) = 6                                          00001020
ISN 0077          KMATR(4,4) = 8                                          00001030
ISN 0078          KMATR(5,1) = 1                                          00001040
ISN 0079          KMATR(5,2) = 2                                          00001050
ISN 0080          KMATR(5,3) = 3                                          00001060
ISN 0081          KMATR(5,4) = 4                                          00001070
ISN 0082          KMATR(6,1) = 5                                          00001080
ISN 0083          KMATR(6,2) = 6                                          00001090
ISN 0084          KMATR(6,3) = 7                                          00001100
ISN 0085          KMATR(6,4) = 8                                          00001110
ISN 0086          IF(BETA.EQ.90.D0) GO TO 2000                            00001120
ISN 0088          TANBET = SINBET/COSBET                                  00001130
ISN 0089     2000 ZSLMAX = 0.0                                            00001140
ISN 0090          DO 2002 I=1,6                                           00001150
ISN 0091          DO 2002 K=1,150                                         00001160
ISN 0092          FINT(I,K) = 0.D0                                        00001170
ISN 0093     2002 CONTINUE                                                00001180
ISN 0094          PRINT 2001                                              00001190
ISN 0095     2001 FORMAT(1H1 / 1X,'MODEL PARAMETERS')                     00001200
ISN 0096          DO 2006 I=1,NM                                          00001210
ISN 0097          IMDRI(I) = 0                                            00001220
ISN 0098     2006 CONTINUE                                                00001230
ISN 0099          DO 2004 IJ=1,NB                                         00001240
ISN 0100          IF(IJPR(IJ).NE.0) IMDRI(JG(IJ))=1                       00001250
ISN 0102     2004 CONTINUE                                                00001260
ISN 0103          DO 2010 I = 1,NM                                        00001270
ISN 0104          IF(IMDRI(I).NE.0) GO TO 2010                            00001280
ISN 0106          WTOT = WTOT+WGT(I)                                      00001290
            C                                                             00001300
            C     FOR SYMMETRICAL MODEL,ADD CONTRIBUTIONS FROM OTHER SIDE. 00001310
            C                                                             00001320
ISN 0107          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2010              00001330
ISN 0109          WTOT = WTOT+WGT(I)                                      00001340
ISN 0110     2010 CONTINUE                                                00001350
ISN 0111          PRINT 2011,WTOT                                         00001360
ISN 0112     2011 FORMAT(/ 1X,'VEHICLE WT = ',1PE12.6)                    00001370
ISN 0113          XGDP = 0.0                                              00001380
ISN 0114          YGDP = 0.0                                              00001390
ISN 0115          ZGDP = 0.0                                              00001400
ISN 0116          DO 2020 I = 1,NM                                        00001410
ISN 0117          IF(IMDRI(I).NE.0) GO TO 2020                            00001420
ISN 0119          XGDP = XGDP+WGT(I)*XDP(I)                               00001430
ISN 0120          YGDP = YGDP+WGT(I)*YDP(I)                               00001440
ISN 0121          ZGDP = ZGDP+WGT(I)*ZDP(I)                               00001450
ISN 0122          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020              00001460
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ISN 0124          XGDP = XGDP+WGT(I)*XDP(I)
ISN 0125          YGDP = YGDP-WGT(I)*YDP(I)
ISN 0126          ZGDP = ZGDP+WGT(I)*ZDP(I)
ISN 0127     2020 CONTINUE
ISN 0128          XGDP = XGDP/WTOT
ISN 0129          YGDP = YGDP/WTOT
ISN 0130          ZGDP = ZGDP/WTOT
ISN 0131          PRINT 2013
ISN 0132     2013 FORMAT(/ 1X,'VEHICLE CG POSITION')
ISN 0133          PRINT 2012,XGDP,YGDP,ZGDP
ISN 0134     2012 FORMAT(1X,'X (FS) = ',1PE12.5 /
                1     1X,'Y (BL) = ',1PE12.5 /
                1     1X,'Z (WL) = ',1PE12.5)
                C APRIME AND ABARPRIME (3)
ISN 0135          CALL EULER(APR,PHIPR,THEPR,PSIPR)
ISN 0136          S1 = SIN(PHIPR)
ISN 0137          C1 = COS(PHIPR)
ISN 0138          S2 = SIN(THEPR)
ISN 0139          C2 = COS(THEPR)
                C NOW ABARPRIME (4)
ISN 0140          ABARPR(1,1) = 1.0
ISN 0141          ABARPR(2,1) = 0.0
ISN 0142          ABARPR(3,1) = 0.0
ISN 0143          ABARPR(1,2) = S1*S2/C2
ISN 0144          ABARPR(2,2) = C1
ISN 0145          ABARPR(3,2) = S1/C2
ISN 0146          ABARPR(1,3) = C1*S2/C2
ISN 0147          ABARPR(2,3) = -S1
ISN 0148          ABARPR(3,3) = C1/C2
                C ANGLE DOT PRIMES (6)
ISN 0149          CALL MATVEC(ABARPR,XMPR,ANGDPR,0)
                C D PRIME (7)
ISN 0150          DPR(1,1) = 0.0
ISN 0151          DPR(1,2) = THEDPR*S1-PSIDPR*C1*C2
ISN 0152          DPR(1,3) = THEDPR*C1+PSIDPR*S1*C2
ISN 0153          DPR(2,1) = -DPR(1,2)
ISN 0154          DPR(2,2) = 0.0
ISN 0155          DPR(2,3) = -PHIDPR+PSIDPR*S2
ISN 0156          DPR(3,1) = -DPR(1,3)
ISN 0157          DPR(3,2) = -DPR(2,3)
ISN 0158          DPR(3,3) = 0.0
                C A DOT PRIME (8)
ISN 0159          CALL MATMUL(APR,DPR,ADPR)
ISN 0160          ZCMAX = 0.0
ISN 0161          ZSLMAX = 0.
ISN 0162          DO 2040 I = 1,NM
ISN 0163          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0164          CALL MATMUL(APR,AIDP,AIC)
ISN 0165          THETA(I) = -ARSIN(AIC(3,1))
ISN 0166          IF(THEPR.GT.PI2.AND.THEPR.LE.PI) THETA(I)=PI-THETA(I)
ISN 0168          IF(THEPR.LT.PI2N.AND.THEPR.GE.PIN) THETA(I)=PIN+THETA(I)
ISN 0170          CT = 1./COS(THETA(I))
ISN 0171          PHI(I) = ARSIN(AIC(3,2)*CT)
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ISN 0172          PSI(I) = ARSIN(AIC(2,1)*CT)                          00002000
ISN 0173          VJP(I,1) = XGDP-XDP(I)                               00002010
ISN 0174          VJP(I,2) = YGDP-YDP(I)                               00002020
ISN 0175          VJP(I,3) = ZGDP-ZDP(I)                               00002030
ISN 0176     2040 CONTINUE                                             00002040
            C                                                          00002050
            C     CALCULATE VECTOR COMPONENTS FROM MASS I TO NODE POINT M 00002060
            C     FOR ALL NNP NODE POINTS.                             00002070
            C                                                          00002080
ISN 0177          IF(NNP.EQ.0) GO TO 2051                              00002090
ISN 0179          DO 3000 JJ=1,NNP                                     00002100
ISN 0180          I = INP(JJ)                                          00002110
ISN 0181          T1 = XDP(I)-XNPDP(JJ)                                00002120
ISN 0182          T2 = YDP(I)-YNPDP(JJ)                                00002130
ISN 0183          T3 = ZDP(I)-ZNPDP(JJ)                                00002140
            C                                                          00002150
            C  THESE ARE IN (-) AIRPLANE AXES.  CONVERT TO BODY AXES BY 00002160
            C  MULTIPLYING BY AIDP TRANSPOSE.  THIS NORMALLY IS UNITY. 00002170
            C                                                          00002180
ISN 0184          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))          00002190
ISN 0185          RX(JJ) = AIDP(1,1)*T1 + AIDP(2,1)*T2 + AIDP(3,1)*T3  00002200
ISN 0186          RY(JJ) = AIDP(1,2)*T1 + AIDP(2,2)*T2 + AIDP(3,2)*T3  00002210
ISN 0187          RZ(JJ) = AIDP(1,3)*T1 + AIDP(2,3)*T2 + AIDP(3,3)*T3  00002220
ISN 0188     3000 CONTINUE                                             00002230
            C                                                          00002240
            C     DETERMINE LOWEST SPRING.                             00002250
            C                                                          00002260
ISN 0189     2051 DO 2050 IKM=1,NSP                                    00002270
ISN 0190          I = II(IKM)                                          00002280
ISN 0191          K = KK(IKM)                                          00002290
ISN 0192          M = MM(IKM)                                          00002300
ISN 0193          IF(M.NE.0) GO TO 2052                                00002310
ISN 0195          RRX = 0.                                             00002320
ISN 0196          RRY = 0.                                             00002330
ISN 0197          RRZ = 0.                                             00002340
ISN 0198          GO TO 2054                                           00002350
ISN 0199     2052 DO 2056 JJ=1,NNP                                     00002360
ISN 0200          IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 2058         00002370
ISN 0202     2056 CONTINUE                                             00002380
ISN 0203     2058 RRX = RX(JJ)                                         00002390
ISN 0204          RRY = RY(JJ)                                         00002400
ISN 0205          RRZ = RZ(JJ)                                         00002410
ISN 0206     2054 CONTINUE                                             00002420
            C                                                          00002430
            C     EQUATIONS (1-122) FOR AI.                            00002440
            C                                                          00002450
ISN 0207          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))          00002460
ISN 0208          CALL MATMUL(APR,AIDP,AIC)                            00002470
ISN 0209          DVR1 = AIC(1,1)*RRX+AIC(1,2)*RRY+AIC(1,3)*RRZ        00002480
ISN 0210          DVR3 = AIC(3,1)*RRX+AIC(3,2)*RRY+AIC(3,3)*RRZ        00002490
ISN 0211          VC = AIC(3,K)*XLBAR(IKM)+DVR3                        00002500
ISN 0212          VCX = AIC(1,K)*XLBAR(IKM)+DVR1                       00002510
ISN 0213          DO 2062 L=1,3                                        00002520
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ISN 0214          VC = VC+APR(3,L)*VJP(I,L)                                       00002530
ISN 0215          VCX = VCX+APR(1,L!*VJP(I,L)                                     00002540
ISN 0216     2062 CONTINUE                                                        00002550
ISN 0217          ZSL = VCX*SINBET+VC*COSBET                                      00002560
ISN 0218          IF(VC-ZCMAX) 2064,2064,2066                                     00002570
ISN 0219     2066 ZCMAX = VC                                                      00002580
ISN 0220     2064 IF(ZSL-ZSLMAX) 2050,2050,2068                                   00002590
ISN 0221     2068 ZSLMAX = ZSL                                                    00002600
ISN 0222     2050 CONTINUE                                                        00002610
ISN 0223          PRINT 2014                                                      00002620
ISN 0224     2014 FORMAT(/ 1X,'VEHICLE INERTIAS (IN-LB-SEC**2)')                  00002630
ISN 0225          XIG = 0                                                         00002640
ISN 0226          YIG = 0                                                         00002650
ISN 0227          ZIG = 0                                                         00002660
ISN 0228          DO 2015 I=1,NM                                                  00002670
ISN 0229          IF(IMDRI(I).NE.0) GO TO 2015                                    00002680
ISN 0231          XARM = XDP(I) - XGDP                                            00002690
ISN 0232          YARM = YDP(I) - YGDP                                            00002700
ISN 0233          ZARM = ZDP(I) - ZGDP                                            00002710
ISN 0234          GOODY1 = WGT(I)*(YARM*YARM+ZARM*ZARM)/386.                      00002720
ISN 0235          GOODY2 = WGT(I)*(XARM*XARM+ZARM*ZARM)/386.                      00002730
ISN 0236          GOODY3 = WGT(I)*(XARM*XARM+YARM*YARM)/386.                      00002740
ISN 0237          XIG = XIG+XI(I)+GOODY1                                          00002750
ISN 0238          YIG = YIG+YI(I)+GOODY2                                          00002760
ISN 0239          ZIG = ZIG+ZI(I)+GOODY3                                          00002770
ISN 0240          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2015                      00002780
ISN 0242          XIG = XIG+XI(I)+GOODY1                                          00002790
ISN 0243          YIG = YIG+YI(I)+GOODY2                                          00002800
ISN 0244          ZIG = ZIG+ZI(I)+GOODY3                                          00002810
ISN 0245     2015 CONTINUE                                                        00002820
ISN 0246          PRINT 2016,XIG,YIG,ZIG                                          00002830
ISN 0247     2016 FORMAT(1X,'I(XX) = ',1PE11.5 / 1X,'I(YY) = ',1PE11.5 / 1X,      00002840
                 1'I(ZZ) = ',1PE11.5)                                             00002850
ISN 0248          ZSL = -ZSLMAX-.001                                              00002860
ISN 0249          ZG = -ZCMAX-.001                                                00002870
ISN 0250          IF(BETA) 2101,2101,2102                                         00002880
ISN 0251     2101 XG = 0.                                                         00002890
ISN 0252          GO TO 2220                                                      00002900
ISN 0253     2102 IF(BETA-90.)   2103,2104,2103                                   00002910
ISN 0254     2104 XG = ZSL                                                        00002920
ISN 0255          GO TO 2220                                                      00002930
ISN 0256     2103 ZSLG = -ZSL/COSBET                                              00002940
ISN 0257          DELZ = -ZG-ZSLG+ZGIN                                            00002950
ISN 0258          XG = DELZ/TANBET                                                00002960
ISN 0259     2220 PRINT 2105                                                      00002970
ISN 0260     2105 FORMAT(/ 1X,'VEHICLE CG INITIAL GROUND COORDINATES' /           00002980
                1 1X,'XCG IS THE DISTANCE FROM SLOPE/GROUND INTERSECTION TO VEHICLE00002990
                2 CG,+FORWARD' /                                                  00003000
                3 1X,'ZCG IS THE DISTANCE FROM GROUND PLANE TO VEHICLE CG,+DOWN') 00003010
ISN 0261          DELXG = XG-XGIN                                                 00003020
ISN 0262          DELZG = ZG-ZGIN                                                 00003030
ISN 0263          PRINT 2091,DELXG,DELZG                                          00003040
ISN 0264     2091 FORMAT(1X,'XCG = ',1PE12.5 / 1X,'ZCG = ',1PE12.5)               00003050
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```
ISN 0265          DO 2022 IJ=1,NB
ISN 0266          I = IG(IJ)
ISN 0267          J = JG(IJ)
ISN 0268          M = MG(IJ)
ISN 0269          N = NG(IJ)
ISN 0270          IF(M.EQ.0) GO TO 5020
ISN 0272          DO 5010 JI=1,NNP
ISN 0273          IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 5020
ISN 0275     5010 CONTINUE
ISN 0276     5020 IF(N.EQ.0) GO TO 5030
ISN 0278          DO 5040 JJ=1,NNP
ISN 0279          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5030
ISN 0281     5040 CONTINUE
            C
            C     THE FOLLOWING CODE GETS CLTEST(IJ),WHICH IS 1 IF BEAM IJ
            C     LIES ENTIRELY IN THE CENTER PLANE OF THE AIRPLANE.THIS
            C     IS USED IN DERIV FOR A NUMBER OF TESTS.
            C
ISN 0282     5030 CLTEST(IJ) = 0.
ISN 0283          IF(SYMFLG.NE.1.) GO TO 2022
ISN 0285          IF(YDP(I).NE.0.OR.YDP(J).NE.0.) GO TO 2022
            C
            C  BOTH MASSES ON CENTERLINE.
            C
ISN 0287          IF(M.EQ.0.AND.N.EQ.0) GO TO 5000
ISN 0289          IF(M.EQ.0) GO TO 5001
ISN 0291          IF(N.EQ.0) GO TO 5002
ISN 0293          IF(YNPDP(JI).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0295          GO TO 2022
ISN 0296     5001 IF(YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0298          GO TO 2022
ISN 0299     5002 IF(YNPDP(JI).EQ.0.) GO TO 5000
ISN 0301          GO TO 2022
ISN 0302     5000 CLTEST(IJ) = 1.
ISN 0303     2022 CONTINUE
            C
            C LOOPC
            C
ISN 0304     2150 DO 2090 I = 1,NM
ISN 0305          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))
ISN 0306          CALL MATMUL(APR,AIDP,AIC)
ISN 0307          VIP(1) = VJP(I,1)
ISN 0308          VIP(2) = VJP(I,2)
ISN 0309          VIP(3) = VJP(I,3)
            C (14)
ISN 0310          CALL MATVEC(APR,VIP,XV,0)
ISN 0311          XV(1) = XV(1)+XG-XGIN
ISN 0312          XV(3) = XV(3)+ZG-ZGIN
ISN 0313          X(I) = XV(1)
ISN 0314          Y(I) = XV(2)
ISN 0315          Z(I) = XV(3)
            C (15)
ISN 0316          CALL MATVEC(ADPR,VIP,XV,0)
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ISN 0317          XV(1) = XV(1)+XGDOT                                     00003590
ISN 0318          XV(2) = XV(2)+YGDOT                                     00003600
ISN 0319          XV(3) = XV(3)+ZGDOT                                     00003610
ISN 0320          XDOT(I) = XV(1)                                         00003620
ISN 0321          YDOT(I) = XV(2)                                         00003630
ISN 0322          ZDOT(I) = XV(3)                                         00003640
            C (16)                                                        00003650
ISN 0323          CALL MATVEC(AIC,XV,VIP,1)                               00003660
ISN 0324          U(I) = VIP(1)                                           00003670
ISN 0325          V(I) = VIP(2)                                           00003680
ISN 0326          W(I) = VIP(3)                                           00003690
            C (17)                                                        00003700
ISN 0327          CALL MATVEC(AIDP,XMPR,VIP,1)                            00003710
ISN 0328          P(I) = VIP(1)                                           00003720
ISN 0329          Q(I) = VIP(2)                                           00003730
ISN 0330          R(I) = VIP(3)                                           00003740
            C AIBAR (18)                                                  00003750
ISN 0331          S1 = SIN(PHI(I))                                        00003760
ISN 0332          C1 = COS(PHI(I))                                        00003770
ISN 0333          S2 = SIN(THETA(I))                                      00003780
ISN 0334          C2 = COS(THETA(I))                                      00003790
ISN 0335          ABARPR(1,2) = S1*S2/C2                                  00003800
ISN 0336          ABARPR(2,2) = C1                                        00003810
ISN 0337          ABARPR(3,2) = S1/C2                                     00003820
ISN 0338          ABARPR(1,3) = C1*S2/C2                                  00003830
ISN 0339          ABARPR(2,3) = -S1                                       00003840
ISN 0340          ABARPR(3,3) = C1/C2                                     00003850
            C (19)                                                        00003860
ISN 0341          CALL MATVEC(ABARPR,VIP,XV,0)                            00003870
ISN 0342          PHIDOT(I) = XV(1)                                       00003880
ISN 0343          THEDOT(I) = XV(2)                                       00003890
ISN 0344          PSIDOT(I) = XV(3)                                       00003900
            C END LOOP C                                                  00003910
ISN 0345     2090 CONTINUE                                                00003920
ISN 0346          IF(NNP.EQ.0) GO TO 4000                                 00003930
ISN 0348          DO 4010 JJ=1,NNP                                        00003940
ISN 0349          I = INP(JJ)                                             00003950
ISN 0350          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))             00003960
ISN 0351          CALL MATMUL(APR,AIDP,AIC)                               00003970
ISN 0352          TX = AIC(1,1)*RX(JJ)+AIC(1,2)*RY(JJ)+AIC(1,3)*RZ(JJ)    00003980
ISN 0353          TY = AIC(2,1)*RX(JJ)+AIC(2,2)*RY(JJ)+AIC(2,3)*RZ(JJ)    00003990
ISN 0354          TZ = AIC(3,1)*RX(JJ)+AIC(3,2)*RY(JJ)+AIC(3,3)*RZ(JJ)    00004000
ISN 0355          XNP(JJ) = X(I)+TX                                       00004010
ISN 0356          YNP(JJ) = Y(I)+TY                                       00004020
ISN 0357          ZNP(JJ) = Z(I)+TZ                                       00004030
ISN 0358     4010 CONTINUE                                                00004040
ISN 0359     4000 CONTINUE                                                00004050
ISN 0360          IF(NOLEO.EQ.0) GO TO 4020                               00004060
ISN 0362          DO 4022 J=1,NOLEO                                       00004070
ISN 0363          YOLEO(J)=0.                                             00004080
ISN 0364     4024 YNEW=-FAO(J)*(EOLEO(J)/(EOLEO(J)-YOLEO(J)))**EXPOLE(J)  00004090
ISN 0365          YNEW=(YNEW+FAA(J))/XKEXT(J)                             00004100
ISN 0366          ERR=ABS(YNEW-YOLEO(J))                                  00004110
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ISN 0367          YOLEO(J)=YNEW                                                00004120
ISN 0368          IF(ERR.LT.0.0001) GO TO 4022                                 00004130
ISN 0370          GO TO 4024                                                   00004140
ISN 0371     4022 CONTINUE                                                     00004150
            C                                                                  00004160
            C     YOLEO = AXIAL COMPRESSSON DISTANCE OF STRUT MEASURED FROM THE 00004170
            C      FULLY EXTENDED POSITION                                     00004180
            C                                                                  00004190
ISN 0372     4020 IF(NIC.LE.0) RETURN                                          00004200
            C                                                                  00004210
            C     COMPUTE PREL. UNCOUPLED LOADS AND DEFLECTIONS                00004220
            C                                                                  00004230
ISN 0374          PRINT 5011                                                   00004240
ISN 0375     5011 FORMAT(// 1X,'BEAM LOADS')                                   00004250
ISN 0376          PRINT 5012                                                   00004260
ISN 0377     5012 FORMAT(// 6X,'BEAM',19X,'AXIAL LOAD',19X,'SHEAR FORCE',22X,  00004270
                *        'MOMENT',20X,'BEAM' / 2X,'IJ  I  J  M  N',3X,'BUCKLING', 00004280
                *        4X,'TENSION   COMPRESSION  LATERAL(Y) VERTICAL(Z)',3X, 00004290
                *        'ROLL(X)',5X,'PITCH(Y)',5X,'YAW(Z)',3X,'IJ  I  J  M  N' / )00004300
ISN 0378          DO 2400 IJ=1,NB                                              00004310
ISN 0379          IF(YY(IJ) .LE. ZZ(IJ)) GO TO 5013                            00004320
ISN 0381          YZMIN(IJ)=ZZ(IJ)                                             00004330
ISN 0382          GO TO 5014                                                   00004340
             C    YZMIN = MIN.CROSS SECTION AREA INERTIA                       00004350
ISN 0383     5013 YZMIN(IJ)=YY(IJ)                                             00004360
            C     CALC.FORCES AND MOMENTS                                      00004370
            C     AXIAL FORCES                                                 00004380
ISN 0384     5014 PCRFFY=4.*PI*PI*E(IJ)*YY(IJ)/(XLB(IJ)**2)                    00004390
ISN 0385          PCRFFZ=4.*PI*PI*E(IJ)*ZZ(IJ)/(XLB(IJ)**2)                    00004400
ISN 0386          PTENS=STENS(MC(IJ))*AA(IJ)                                   00004410
ISN 0387          PCOMP=SCOMP(MC(IJ))*AA(IJ)                                   00004420
            C     SHEAR FORCES                                                 00004430
ISN 0388          FY=.67*SHEAR(MC(IJ))*AA(IJ)                                  00004440
ISN 0389          FZ=FY                                                        00004450
            C     MOMENTS                                                      00004460
ISN 0390          IF(XIQ(IJ).NE.0.) GO TO 400                                  00004470
ISN 0392          TMOMX = 0.                                                   00004480
ISN 0393          GO TO 410                                                    00004490
ISN 0394      400 TMOMX=SHEAR(MC(IJ))/XIQ(IJ)                                  00004500
ISN 0395      410 SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))                  00004510
ISN 0396          IF(Z1(IJ).NE.0.) GO TO 420                                   00004520
ISN 0398          BENDMY = 0.                                                  00004530
ISN 0399          GO TO 430                                                    00004540
ISN 0400      420 BENDMY=SYIELD*YY(IJ)/Z1(IJ)                                  00004550
ISN 0401      430 IF(Z2(IJ).NE.0.) GO TO 440                                   00004560
ISN 0403          BENDMZ = 0.                                                  00004570
ISN 0404          GO TO 450                                                    00004580
ISN 0405      440 BENDMZ=SYIELD*ZZ(IJ)/Z2(IJ)                                  00004590
            C                                                                  00004600
            C     CHECK BEAM END CONDITIONS.                                   00004610
            C                                                                  00004620
ISN 0406      450 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 100                   00004630
ISN 0408          IF(PY(IJ).EQ.0.OR.PYJ(IJ).EQ.0) GO TO 110                    00004640
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          C  PINNED-PINNED.                                                    00004650
ISN 0410         PCRY = PCRFFY/4.                                              00004660
ISN 0411         BENDMY = 0.                                                   00004670
ISN 0412         FZ = 0.                                                       00004680
ISN 0413         GO TO 120                                                     00004690
          C  FIXED-PINNED.                                                     00004700
ISN 0414     110 PCRY = PCRFFY/2.                                              00004710
ISN 0415         GO TO 120                                                     00004720
          C  FIXED-FIXED                                                       00004730
ISN 0416     100 PCRY = PCRFFY                                                 00004740
ISN 0417     120 IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 200                    00004750
ISN 0419         IF(PZ(IJ).EQ.0.OR.PZJ(IJ).EQ.0) GO TO 210                     00004760
          C  PINNED-PINNED.                                                    00004770
ISN 0421         PCRZ = PCRFFZ/4.                                              00004780
ISN 0422         BENDMZ = 0.                                                   00004790
ISN 0423         FY = 0.                                                       00004800
ISN 0424         GO TO 220                                                     00004810
          C  FIXED-PINNED.                                                     00004820
ISN 0425     210 PCRZ = PCRFFZ/2.                                              00004830
ISN 0426         GO TO 220                                                     00004840
          C  FIXED-FIXED                                                       00004850
ISN 0427     200 PCRZ = PCRFFZ                                                 00004860
ISN 0428     220 PCR(IJ) = PCRZ                                                00004870
ISN 0429         IF(PCRY.LT.PCRZ) PCR(IJ)=PCRY                                 00004880
ISN 0431    5018 PRINT 5015,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),PCR(IJ),PTENS,     00004890
               1 PCOMP,FY,FZ,TMOMX,BENDMY,BENDMZ,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ)) 00004900
ISN 0432    5015 FORMAT(1X,5I3,1P8E12.4,5I3)                                   00004910
ISN 0433    2400 CONTINUE                                                      00004920
ISN 0434         PRINT 5050                                                    00004930
ISN 0435    5050 FORMAT(// 1X,'BEAM DEFLECTIONS')                              00004940
ISN 0436         PRINT 5051                                                    00004950
ISN 0437    5051 FORMAT(// 6X,'BEAM',17X,'DEFLECTION',25X,'TRANSLATION DUE TO',23X,00004960
               *     'ROTATION ABOUT' / 2X,'IJ  I  J  M  N',2X,'BUCKLING',4X,  00004970
               *     'TENSION  COMPRESSION   F(Y)',7X,'F(Z)',7X,'BM(Z)',6X,    00004980
               *     'BM(Y)',5X,'X-AXIS      Y-AXIS      Z-AXIS' / )           00004990
          C                                                                    00005000
          C      CALC.DEFLECTIONS                                              00005010
          C                                                                    00005020
          C      AXIAL DEFLECTIONS                                             00005030
          C                                                                    00005040
ISN 0438         DO 2500 IJ=1,NB                                               00005050
ISN 0439         SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))                   00005060
ISN 0440         IF(XK3(1,1,IJ) .EQ. 0.0) GO TO 5330                           00005070
ISN 0442         XDEFB = PCR(IJ)/XK3(1,1,IJ)                                   00005080
ISN 0443         XDEFT=STENS(MC(IJ))*AA(IJ)/XK3(1,1,IJ)                        00005090
ISN 0444         XDEFC=SCOMP(MC(IJ))*AA(IJ)/XK3(1,1,IJ)                        00005100
ISN 0445         GO TO 5340                                                    00005110
ISN 0446    5330 XDEFB = 0.0                                                   00005120
ISN 0447         XDEFT = 0.0                                                   00005130
ISN 0448         XDEFC = 0.0                                                   00005140
ISN 0449    5340 CONTINUE                                                      00005150
          C      DUE TO SHEAR FORCES                                           00005160
ISN 0450         IF(XK3(2,2,IJ) .EQ. 0.0) GO TO 5350                           00005170
```

```
ISN 0452          YDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(2,2,IJ)
ISN 0453          GO TO 5360
ISN 0454     5350 YDSF = 0.0
ISN 0455     5360 IF(XK3(3,3,IJ) .EQ. 0.0) GO TO 5370
ISN 0457          ZDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(3,3,IJ)
ISN 0458          GO TO 5380
ISN 0459     5370 ZDSF = 0.0
ISN 0460     5380 CONTINUE
            C     DEFL. DUE TO BEND.FORCE      ((K55/DEL)*FORCE)
ISN 0461          IF(XK3(2,2,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5390
ISN 0463          YMOMZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XLB(IJ)*XK3(2,2,IJ))
ISN 0464          GO TO 5400
ISN 0465     5390 YMOMZ = 0.0
ISN 0466     5400 IF(XK3(3,3,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5410
ISN 0468          ZMOMY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XLB(IJ)*XK3(3,3,IJ))
ISN 0469          GO TO 5420
ISN 0470     5410 ZMOMY = 0.0
ISN 0471     5420 CONTINUE
            C     TORSIONAL ROTATION
ISN 0472          IF(XK3(4,4,IJ).NE.0.AND.XIQ(IJ).NE.0.) GO TO 5317
ISN 0474          ROTX=0.0
ISN 0475          GO TO 5318
ISN 0476     5317 ROTX=SHEAR(MC(IJ))/XIQ(IJ)/XK3(4,4,IJ)
            C     BEND. ROTATION    ((K33/DEL)*MOM.)
ISN 0477     5318 IF(XK3(5,5,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5430
ISN 0479          ROTY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XK3(5,5,IJ))
ISN 0480          GO TO 5440
ISN 0481     5430 ROTY = 0.0
ISN 0482     5440 IF(XK3(6,6,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5450
ISN 0484          ROTZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XK3(6,6,IJ))
ISN 0485          GO TO 5460
ISN 0486     5450 ROTZ = 0.0
ISN 0487     5460 CONTINUE
ISN 0488     5316 PRINT 5319, (IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),XDEFB,XDEFT,XDEFC,
                 1 YDSF,ZDSF,YMOMZ,ZMOMY,ROTX,ROTY,ROTZ)
ISN 0489     5319 FORMAT(1X,5I3,1P10E11.3)
ISN 0490     2500 CONTINUE
ISN 0491          RETURN
ISN 0492          END
```

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************************************************************************************
*                                                                                  *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                        SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
             C          DATA SET D2334IFRNT AT LEVEL 009 AS OF 06/25/79
             C          DATA SET D2332GIR   AT LEVEL 002 AS OF 05/02/78
             C          DATA SET D2332VIR   AT LEVEL 004 AS OF 01/26/78
             C          DATA SET D2332MIR   AT LEVEL 008 AS OF 01/12/78
ISN 0002            SUBROUTINE INPRNT
             C
ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004            REAL*8 KUN
ISN 0005            REAL*8 LBAR,MU,KE,CASEIN,CASOUT,MINDT
ISN 0006            REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)
ISN 0007            INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150),RUNIN,RUNOUT
ISN 0008            INTEGER*4 TITLE(40),BLANK,STOP
ISN 0009            INTEGER*4 DIR
ISN 0010            INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)
ISN 0011            INTEGER*2 MQ(180),NQ(180)
ISN 0012            INTEGER*2 CHUG,INBUFF,IIN,II(40),KK(40),INBUF(80)
ISN 0013            INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR
ISN 0014            INTEGER*2 N1,NN,IBS,IG,JG
ISN 0015            INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE
ISN 0016            INTEGER*2 NTOL1,NTOL2,NTOL3
ISN 0017            INTEGER*2 IJSAVE(180)
ISN 0018            INTEGER*2 NKMVEC(150)
ISN 0019            INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)
ISN 0020            DIMENSION G(150),XP(8),YP(8),ZP(8),VMAX2(6,150),FMAX2(6,150)
ISN 0021            DIMENSION VMAX3(6,150),FMAX3(6,150)
ISN 0022            DIMENSION XK3(6,6,150)
ISN 0023            DIMENSION IJPRT(14),VMAXT(6),FMAXT(6)
ISN 0024            DIMENSION MASSNO(50),DIR(50),NPTS(50)
ISN 0025            DIMENSION IPHDP(80)
ISN 0026            DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)
ISN 0027            COMMON/IBALL/ IBUF1(20)
ISN 0028            COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VDLENZ(5,3),
                   1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
                   2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
                   3 MVP
ISN 0029            COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),
                   1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),
                   2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN
ISN 0030            COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
                   1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0031            COMMON/DOIN/ CBAR(150)
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ISN 0032        COMMON/DEIR/ PLM26(150),PLM35(150),PLM26J(150),PLM35J(150)       00000410
ISN 0033        COMMON/CFIR/ SIFL(40),SAFL(40),SBFL(40),SFFL(40),XKEFL(40)       00000420
ISN 0034        COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT      00000430
ISN 0035        COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),        00000440
               1 XMAX(40),FSPOF(40),FSPOI(40),EFLEX(40),CDAMP(40),PLOWT          00000450
ISN 0036        COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10),    00000460
               *               NMPTS(10),MNUM(50,10),ISCALE(10)                  00000470
ISN 0037        COMMON/INDEAC/ NACC                                               00000480
ISN 0038        COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                 00000490
               1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,              00000500
               2 XGDOT,YGDOT,ZGDOT                                               00000510
ISN 0039        COMMON/INIDCP/ YDP(80)                                            00000520
ISN 0040        COMMON/INPR/  NDRI,NSP                                            00000530
ISN 0041        COMMON/INCFIC/ BETA                                               00000540
ISN 0042        COMMON/IRDE/ PFIL                                                 00000550
ISN 0043        COMMON/MACFIN/ TMAX,IPRINT                                        00000560
ISN 0044        COMMON/MCFIII/ SYMFLG                                             00000570
ISN 0045        COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                                00000580
ISN 0046        COMMON/NP00I2/ MG,NG,INP,MNP                                      00000590
ISN 0047        COMMON/NP01I2/ II,KK,MM                                           00000600
ISN 0048        COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN                        00000610
ISN 0049        COMMON/NP00I4/ NNP                                                00000620
ISN 0050        COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                  00000630
ISN 0051        COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),        00000640
               1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),  00000650
               2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO        00000660
ISN 0052        COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000670
               1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),           00000680
               2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),          00000690
               3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),   00000700
               4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80), 00000710
               5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT, 00000720
               6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                            00000730
               7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,            00000740
               8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),          00000750
               9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),        00000760
               A CEIKF(40),                                                      00000770
               B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                           00000780
               C NM,NB,I,J,IG(150),JG(150),                                      00000790
               D N1(900),NN(40),IJPR(150)                                        00000800
ISN 0053        COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP                   00000810
ISN 0054        COMMON/COMMR8/ G                                                  00000820
ISN 0055        COMMON/UB/ DB(150),IJUB(150),NUB                                  00000830
ISN 0056        COMMON/STUFF/ NEWI(80),NEWIJ(150),NMOLD,NBOLD                     00000840
ISN 0057        COMMON/COMMR4/ KR     ,LDP    ,LDP1                               00000850
ISN 0058        COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,                         00000860
               1              NPH    ,NMTL   ,NPTS   ,NVBM   ,IJPRT ,IPHDP,NFBM  00000870
ISN 0059        COMMON/COMMI2/ IQ            ,JQ             ,LQ     ,NPQ    ,INBUF , 00000880
               1              NKMVEC,IJSAVE                                      00000890
ISN 0060        COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3                              00000900
ISN 0061        COMMON/IPIC/ NIC                                                  00000910
ISN 0062        COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)       00000920
ISN 0063        COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR     00000930
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ISN 0064          EQUIVALENCE (XK(1),XK3(1,1,1))                              00000940
ISN 0065          EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))           00000950
ISN 0066          EQUIVALENCE(VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))          00000960
ISN 0067          EQUIVALENCE (MASSNO(1),INDEX(1,1))                          00000970
ISN 0068          EQUIVALENCE (DIR(1),INDEX(1,2))                             00000980
ISN 0069          SQRT(X) = DSQRT(X)                                          00000990
ISN 0070          ABS(X) = DABS(X)                                            00001000
ISN 0071          PI = 3.141592653500                                         00001010
            C                                                                 00001020
            C     CARD 0001,0002                                              00001030
            C                                                                 00001040
ISN 0072          PRINT 5500, TITLE                                           00001050
ISN 0073     5500 FORMAT(1H1,20A4,/,1X,20A4)                                  00001060
            C                                                                 00001070
            C     CARD 0003                                                   00001080
            C                                                                 00001090
ISN 0074          PRINT 5504                                                  00001100
ISN 0075     5504 FORMAT(//1X,'PROGRAM SIZE DATA',/)                          00001110
            C                                                                 00001120
            C     CARD 0004                                                   00001130
            C                                                                 00001140
ISN 0076          PRINT 5507,NM,NSP,NB,NLB,NHI,MVP,NVCH,NDRI,NMTL,NACC,NVBM,  00001150
                1 NVBMN,NFBM,NFBMN,NPH,ND,NKM,NNP                             00001160
ISN 0077     5507 FORMAT(1X,'NUMBER OF:',/,33X,'NON-',45X,'NON-',5X,'NON-',/,33X,  00001170
                1 'ZERO',43X,'STANDARD',1X,'STANDARD',1X,'NON-',4X,'NON-',14X,  00001180
                2 'NO.',/,27X,'KR',4X,'HE OR',4X,'MASS',3X,'VOLUME',3X,'DRI',5X,  00001190
                3 'MTL ',3X,'ACCEL.',3X,'MAX.',5X,'MAX.',3X,'ZERO',2X,        00001200
                4 'STANDARD STIFFNESS NODE',/,1X,'MASSES',2X,'SPRINGS',      00001210
                5 2X,'BEAMS',2X,'TABLES',3X,'IXY',4X,'PENETR.',1X,            00001220
                6 'CHANGE',1X,'ELEMENTS',1X,'TYPES',3X,'TABLES',2X,'DEFL.',4X,  00001230
                7 'FORCE',2X,5HPHI'',2X,'DAMPING',2X,'MATRICES  PTS.',/,      00001240
                8 82X,'NVB',6X,'NFB',/,3X,'NM',                               00001250
                9 6X,'NSP',5X,'NB',5X,'NLB',5X,'NHI',5X,'MVP',5X,'NVCH',4X,    00001260
                A 'NDRI',3X,'NMTL',5X,'NACC',3X,'+',3X,'-',3X,'+',3X,'-',4X,  00001270
                B 'NPH',6X,'ND',7X,'NKM',5X,'NNP',/,                          00001280
                C 1X,I4,2I8,I7,I8,I8,I9,I8,I7,I9,I5,3(I4),I7,2I9,I8)          00001290
ISN 0078          PRINT 5961,NSC,NIC,NTOL1,NTOL2,NTOL3                        00001300
ISN 0079     5961 FORMAT(/,2X,'NSC=',I5,5X,'NIC=',I5,5X,'NTOL1=',I5,'%',      00001310
                1 5X,'NTOL2=',I5,'%',5X,'NTOL3=',I5,'%')                      00001320
ISN 0080          PRINT 5962,NOLEO,ALPHAP                                     00001330
ISN 0081     5962 FORMAT(/,2X,'NO.OF OLEO STRUTS=',I5,5X,'ALPHA=',P1E10.3)    00001340
ISN 0082          PRINT 1000,CASEIN,CASOUT,RUNIN,RUNOUT,MSECIN,MSCOUT         00001350
ISN 0083     1000 FORMAT(//2X,'PROGRAM DATA MANAGEMENT CONTROL DATA',         00001360
                1     //10X,'RESTART:',T20,'TITLE - ',A8,                     00001370
                2       T50,'SAVE:'    ,T56,'TITLE - ',A8,                    00001380
                3      /T20,'CASE  - ',I4,T56,'CASE  - ',I4,                  00001390
                4      /T20,'TIME  - ',I4,T56,'TIMES - ',5I4)                 00001400
ISN 0084          PRINT 1008,IVAR,EL,EU,RATMIN,RATMAX                         00001410
ISN 0085     1008 FORMAT(///2X,'VARIABLE INTEGRATION CONTROL DATA',           00001420
                1     //5X,'VAR. INT. FLAG = ',I1,                            00001430
                2        2X,'EL = ',F6.3,2X,'EU = ',F6.3,                     00001440
                3        2X,'LOWER RATIO = ',F5.2,2X,'UPPER RATIO = ',F5.2)   00001450
ISN 0086          PRINT 5501                                                  00001460
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ISN 0087      5501 FORMAT(//,1X,'PROGRAM CONTROL DATA',//,
                  1  3X,'PRINT INTERVAL/',11X,'INTEGRATION',9X,'MAX.',10X,
                  2 'PLOW FORCE',9X,'FILTER CUTOFF',7X,'CASE TYPE',/,
                  3             1X,'INTEGRATION INTERVAL',9X,'INTERVAL',11X,'TIME',
                  4 9X,'STARTING TIME',9X,'FREQUENCY',9X,'INDICATOR',//,
                  5 8X,'DP/DT',20X,'DT',14X,'TMAX',13X,'PLOWT',15X,'FCUT',14X,
                  6 'RUNMOD')
ISN 0088            PRINT 5503,    IPRINT,DELTAT,TMAX,PLOWT,FCUT,RUNMOD
ISN 0089      5503 FORMAT(8X,I4,18X,F8.6,9X,F8.6,12X,F7.5,10X,F7.3,12X,F7.3)
ISN 0090            IF(FCUT.EQ.0.) GO TO 5509
ISN 0092            PFIL = 1./(2.*PI*FCUT)
ISN 0093            GO TO 5511
ISN 0094      5509 PFIL = 0.
              C
              C     CARD 0005,006,007
              C
ISN 0095      5511 PRINT 3000,NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP
ISN 0096      3000 FORMAT(//,1X,'TIME HISTORY PRINT CONTROL CARDS',//
                  1 2X,'STRAIN',3X,'TOTAL',4X,'BEAM',6X,'EXT.SPRING',
                  2 2X,'ENERGY',2X,'STRESS',2X,'ACCEL',2X,'IMPULSE',/2X,'FORCES',
                  3 2X,'FORCES',1X,'DEFLECTIONS',5X,'DATA',6X,'DATA',
                  4 4X,'DATA',3X,'DATA',3X,'DATA',/4X,I2,I8,I9,I12,I11,I8,I7,I8)
ISN 0097            IF(NPLT.EQ.0) GO TO 5519
ISN 0099      5513 PRINT 3002,NPLT,NPFCT
ISN 0100      3002 FORMAT(//,1X,'NO.OF MASS POSITION PLOTS EACH TIME=',I5,10X,
                  *        'PLOT PRINT FACTOR =',I5)
ISN 0101            PRINT 3003
ISN 0102      3003 FORMAT(//,1X,'PLANE I.D.',5X,'NO.OF POINTS')
ISN 0103            PRINT 3004,(ITPL(J),NMPTS(J),J=1,NPLT)
ISN 0104      3004 FORMAT(3X,I5,8X,I5)
ISN 0105            GO TO 5510
ISN 0106      5519 PRINT 3001
ISN 0107      3001 FORMAT(//,1X,'NO.MASS POSITION PLOTS')
ISN 0108      5510 PRINT 4000
ISN 0109      4000 FORMAT(//,1X,'VEHICLE INITIAL CONDITIONS',//,
                  1 1X,'VEHICLE TRANSLATIONAL VELOCITIES IN GROUND AXES (IN/SEC)',/
                  2 1X,'VEHICLE ROTATIONAL VELOCITIES IN VEHICLE AXES (RAD/SEC)',/
                  3 1X,'EULER ANGLES OF VEHICLE RELATIVE TO GROUND (RADIANS)',//
                  4 9X,'XGDOT',13X,'YGDOT',13X,'ZGDOT',/,11X,'P''',16X,'Q''',16X,
                  5 'R''',/,10X,'PHI''',13X,'THETA''',13X,'PSI''',/)
ISN 0110            PRINT 5502, XGDOT,YGDOT,ZGDOT
ISN 0111            PRINT 5502, PPR,QPR,RPR
ISN 0112            PRINT 5502, PHIPR,THEPR,PSIPR
ISN 0113      5502 FORMAT(3(5X,1PE13.5))
ISN 0114            PRINT 4003
ISN 0115      4003 FORMAT(/,1X,'GENERALIZED SURFACE DATA',/)
ISN 0116            PRINT 3999,BETA,XGIN,ZGIN
ISN 0117      3999 FORMAT(1X,'BETA = ',F5.1,' DEGREES',/,1X,'XGIN = ',F5.1,/,
                  1 1X,'ZGIN = ',F5.1)
              C
              C     BEAM AND MASS NUMBERING CORRESPONDENCE (LEFT/RIGHT) DATA
              C
ISN 0118            IF(RUNMOD.LT.2) GO TO 1010
```

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ISN 0120            NMAX = MAX0(NMOLD,NBOLD)                                      00002000
ISN 0121            PRINT 1050                                                    00002010
ISN 0122       1050 FORMAT(//,1X,'CORPESPONDING MASS AND BEAM NUMBERS FOR',       00002020
              1              ' LEFT AND RIGHT SIDES OF AIRPLANE')                  00002030
ISN 0123            PRINT 1051                                                    00002040
ISN 0124       1051 FORMAT(/3X,'MASSES',23X,'BEAMS'//1X,'LEFT  RIGHT',12X,'LEFT',  00002050
              1         14X,'RIGHT'/3X,'I',5X,'I',9X,'IJ  I  J  M  N    IJ  ',     00002060
              2         'I  J  M  N')                                              00002070
ISN 0125            DO 1020 I=1,NMAX                                              00002080
ISN 0126            IF(I.GT.NMOLD) GO TO 1030                                     00002090
ISN 0128            IF(I.GT.NBOLD) GO TO 1040                                     00002100
ISN 0130            INEW = NEWI(I)                                                00002110
ISN 0131            IJNEW = NEWIJ(I)                                              00002120
ISN 0132            IF(IJNEW.NE.0) GO TO 1042                                     00002130
ISN 0134            IGT = 0                                                       00002140
ISN 0135            JGT = 0                                                       00002150
ISN 0136            MGT = 0                                                       00002160
ISN 0137            NGT = 0                                                       00002170
ISN 0138            GO TO 1044                                                    00002180
ISN 0139       1042 IGT = IG(IJNEW)                                               00002190
ISN 0140            JGT = JG(IJNEW)                                               00002200
ISN 0141            MGT = MG(IJNEW)                                               00002210
ISN 0142            NGT = NG(IJNEW)                                               00002220
ISN 0143       1044 PRINT 1052,I,INEW,I,IG(I),JG(I),MG(I),NG(I),IJNEW,IGT,JGT,MGT,NGT 00002230
ISN 0144            GO TO 1020                                                    00002240
ISN 0145       1030 IJNEW = NEWIJ(I)                                              00002250
ISN 0146            IF(IJNEW.NE.0) GO TO 1046                                     00002260
ISN 0148            IGT = 0                                                       00002270
ISN 0149            JGT = 0                                                       00002280
ISN 0150            MGT = 0                                                       00002290
ISN 0151            NGT = 0                                                       00002300
ISN 0152            GO TO 1048                                                    00002310
ISN 0153       1046 IGT = IG(IJNEW)                                               00002320
ISN 0154            JGT = JG(IJNEW)                                               00002330
ISN 0155            MGT = MG(IJNEW)                                               00002340
ISN 0156            NGT = NG(IJNEW)                                               00002350
ISN 0157       1048 PRINT 1053,I,IG(I),JG(I),MG(I),NG(I),IJNEW,IGT,JGT,MGT,NGT    00002360
ISN 0158            GO TO 1020                                                    00002370
ISN 0159       1040 PRINT 1052,I,NEWI(I)                                          00002380
ISN 0160       1020 CONTINUE                                                      00002390
ISN 0161       1052 FORMAT(2X,I2,4X,I2,5X,2(3X,5I3))                              00002400
ISN 0162       1053 FORMAT(15X,2(3X,5I3))                                         00002410
ISN 0163       1010 PRINT 5498                                                    00002420
ISN 0164       5498 FORMAT(//,1X,'MASS DATA')                                     00002430
ISN 0165            PRINT 5499                                                    00002440
ISN 0166       5499 FORMAT(//,9X,'WEIGHTS',11X,'MASS COORDINATES F.S.,B.L.,W.L.',10X, 00002450
              1 'MASS MOMENTS OF INERTIA (LB-IN-SEC**2)',/)                        00002460
ISN 0167            PRINT 5505                                                    00002470
ISN 0168       5505 FORMAT(2X,'I',8X,'W',14X,3HX'',12X,3HY'',12X,3HZ'',12X,'IX',   00002480
              1 13X,'IY',13X,'IZ',10X,'I')                                         00002490
           C                                                                      00002500
           C        CARDS 0100                                                    00002510
           C                                                                      00002520
```

```
ISN 0169          PRINT 5506, (I,WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),I,
                 1 I=1,NM)
ISN 0170     5506 FORMAT(1X,I2,1P7E15.5,4X,I2)
            C
            C     CARDS 0200
            C
ISN 0171          IF(NNP.EQ.0) GO TO 5534
ISN 0173          PRINT 2000
ISN 0174     2000 FORMAT(//,1X,'NODE POINT DATA',//,
                 1 3X,'MASS',2X,'N.P.',4X,'NODE POINT COORDINATES F.S.,B.L.,W.L.',
                 2 /,5X,'I',4X,'M',8X,3HX'',11X,3HY'',12X,3HZ'')
ISN 0175          PRINT 4001,(INP(I),MNP(I),XNPDP(I),YNPDP(I),ZNPDP(I),I=1,NNP)
ISN 0176     4001 FORMAT(1X,2I5,1P3E15.5)
            C
            C     CARDS 0300
            C
ISN 0177     5534 IF(NSP.EQ.0) GO TO 5535
ISN 0179          PRINT 4004
ISN 0180     4004 FORMAT(///,1X,'EXTERNAL SPRING DATA')
ISN 0181          PRINT 4008
ISN 0182     4008 FORMAT(//,17X,'FREE',9X,'FRICTION',7X,'BOTTOMING',7X,'PLOWING',
                 1 8X,'GROUND',/,
                 2 5X,'SPRING',5X,'LENGTH',7X,'COEFFICIENT',6X,'SPRING',9X,'FORCE',
                 3 8X,'FLEXIBILITY',/)
ISN 0183          PRINT 5515
ISN 0184     5515 FORMAT(3X,'I',2X,'K',2X,'M',
                 1 5X,'LBAR(IKM)',6X,'MU(IKM)',8X,'KE(IKM)',8X,
                 2 'FORCE(IKM)',5X,'GFLEX(IKM)')
ISN 0185          PRINT 5516,(II(J),KK(J),MM(J),XLBAR(J),XMU(J),XKE(J),XMAX(J),
                 1 GFLEX(J),J=1,NSP)
ISN 0186     5516 FORMAT(1H ,3I3,1P5E15.5)
ISN 0187          PRINT 4009
ISN 0188     4009 FORMAT(/2X'SPRING',23X,'DEFLECTION COORDINATES',25X,'SPRING AXIAL
                 1FORCES',/)
ISN 0189          PRINT 5517
ISN 0190     5517 FORMAT(3X,'I',2X,'K',2X,'M',6X,'SI(IKM)',8X,'SA(IKM)',8X,
                 1 'SB(IKM)',8X,'SF(IKM)',7X,'FSPOI(IKM)',5X,'FSPOF(IKM)',6X,
                 2  'CRIT.DAMP',4X,'CDAMP(IKM)')
            C
            C  CALCULATE SPRING TABLE PARAMETERS INCLUDING FLEXIBLE GROUND EFFECTS.
            C
ISN 0191          DO 10 J=1,NSP
ISN 0192          SIFL(J) = SI(J) + FSPOI(J)*GFLEX(J)
ISN 0193          SAFL(J) = SA(J) + FSPOI(J)*GFLEX(J)
ISN 0194          SBFL(J) = SB(J) + FSPOF(J)*GFLEX(J)
ISN 0195          SFFL(J) = SF(J) + FSPOF(J)*GFLEX(J)
ISN 0196          IF(XKE(J).EQ.0.) GO TO 20
ISN 0198          XKEFL(J) = 1./(GFLEX(J)+1./XKE(J))
ISN 0199          GO TO 10
ISN 0200       20 XKEFL(J) = 0.
ISN 0201       10 CONTINUE
            C
            C     CARDS 0400
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                C                                                                00003060
ISN 0202              DO 5160 IKM=1,NSP                                          00003070
ISN 0203              I = II(IKM)                                                00003080
ISN 0204              K = KK(IKM)                                                00003090
ISN 0205              M = MM(IKM)                                                00003100
ISN 0206              XKUN=FSPOI(IKM)/SI(IKM)                                    00003110
ISN 0207              SRT=2.*SQRT(XKUN*WGT(I)/386.4)*CDAMP(IKM)                  00003120
                C       SRT=2*CRIT.DAMPING*SQRT(K*M)                             00003130
ISN 0208              PRINT 5518,I,K,M,SI(IKM),SA(IKM),SB(IKM),SF(IKM),FSPOI(IKM), 00003140
                     1 FSPOF(IKM),CDAMP(IKM),SRT                                 00003150
ISN 0209         5518 FORMAT(1H,3I3,1P8E15.5)                                    00003160
ISN 0210              CDAMP(IKM)=SRT                                             00003170
ISN 0211         5160 CONTINUE                                                   00003180
                C                                                                00003190
                C     CARDS 0500                                                 00003200
                C                                                                00003210
                C     MAT.PROP.VALUES                                            00003220
                C     MC=1(4130 STEEL),2(6150H STEEL),3(STAINLESS 3000 SERIES),  00003230
                C      4(AL.2024-T3),5(AL.6061-T3),6(CAST AL.B195-T4)            00003240
                C      7(LOW MOD.MAT.),8(JUNK),9,10(SPINE FOR DRI)               00003250
                C                                                                00003260
ISN 0212              EE(1)=30.E06                                               00003270
ISN 0213              EE(2)=30.E06                                               00003280
ISN 0214              EE(3)=28.E06                                               00003290
ISN 0215              EE(4)=10.5E06                                              00003300
ISN 0216              EE(5)=10.0E06                                              00003310
ISN 0217              EE(6)=EE(5)                                                00003320
ISN 0218              EE(7)=1.0E06                                               00003330
ISN 0219              EE(8)=1.0E06                                               00003340
ISN 0220              EE(9)=1.0E06                                               00003350
ISN 0221              EE(10)=1.0E06                                              00003360
ISN 0222              GG(1)=11.0E06                                              00003370
ISN 0223              GG(2)=GG(1)                                                00003380
ISN 0224              GG(3)=12.5E06                                              00003390
ISN 0225              GG(4)= 4.0E06                                              00003400
ISN 0226              GG(5)= 3.8E06                                              00003410
ISN 0227              GG(6)= 3.8E06                                              00003420
ISN 0228              GG(7)= .30E06                                              00003430
ISN 0229              GG(8)= 0.                                                  00003440
ISN 0230              GG(9)= .30E06                                              00003450
ISN 0231              GG(10)= .30E06                                             00003460
ISN 0232              STENS(1)=75000.                                            00003470
ISN 0233              STENS(2)=205000.                                           00003480
ISN 0234              STENS(3)=70000.                                            00003490
ISN 0235              STENS(4)=47000.                                            00003500
ISN 0236              STENS(5)=35000.                                            00003510
ISN 0237              STENS(6)=16000.                                            00003520
ISN 0238              STENS(7)=16000.                                            00003530
ISN 0239              STENS(8)=16000.                                            00003540
ISN 0240              STENS(9)=16000.                                            00003550
ISN 0241              STENS(10)=16000.                                           00003560
ISN 0242              SCOMP(1)=75000.                                            00003570
ISN 0243              SCOMP(2)=205000.                                           00003580
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ISN 0244           SCOMP(3)=46000.                                        00003590
ISN 0245           SCOMP(4)=39000.                                        00003600
ISN 0246           SCOMP(5)=34000.                                        00003610
ISN 0247           SCOMP(6)=16000.                                        00003620
ISN 0248           SCOMP(7)=16000.                                        00003630
ISN 0249           SCOMP(8)=16000.                                        00003640
ISN 0250           SCOMP(9)=16000.                                        00003650
ISN 0251           SCOMP(10)=16000.                                       00003660
ISN 0252           SHEAR(1)=37500.                                        00003670
ISN 0253           SHEAR(2)=80000.                                        00003680
ISN 0254           SHEAR(3)=36000.                                        00003690
ISN 0255           SHEAR(4)=22000.                                        00003700
ISN 0256           SHEAR(5)=17000.                                        00003710
ISN 0257           SHEAR(6)=17000.                                        00003720
ISN 0258           SHEAR(7)=17000.                                        00003730
ISN 0259           SHEAR(8)=17000.                                        00003740
ISN 0260           SHEAR(9)=17000.                                        00003750
ISN 0261           SHEAR(10)=17000.                                       00003760
ISN 0262      5535 DO 5306 IJ=1,NB                                        00003770
ISN 0263           IF(NKMVEC(IJ).NE.0) GO TO 5306                         00003780
ISN 0265           DO 5305 L=1,6                                          00003790
ISN 0266           DO 5305 K=1,6                                          00003800
ISN 0267           XK3(L,K,IJ) = 0.                                       00003810
ISN 0268      5305 CONTINUE                                               00003820
ISN 0269      5306 CONTINUE                                               00003830
              C    CALCULATE BEAM LENGTHS                                 00003840
ISN 0270           DO 5054 IJ=1,NB                                        00003850
ISN 0271           I = IG(IJ)                                             00003860
ISN 0272           J = JG(IJ)                                             00003870
ISN 0273           M = MG(IJ)                                             00003880
ISN 0274           N = NG(IJ)                                             00003890
              C                                                           00003900
              C    FIRST ASSUME BEAM ENDS ARE AT MASS POINTS.             00003910
              C                                                           00003920
ISN 0275           XDPI = XDP(I)                                          00003930
ISN 0276           YDPI = YDP(I)                                          00003940
ISN 0277           ZDPI = ZDP(I)                                          00003950
ISN 0278           IF(J.EQ.0) GO TO 5212                                  00003960
ISN 0280           XDPJ = XDP(J)                                          00003970
ISN 0281           YDPJ = YDP(J)                                          00003980
ISN 0282           ZDPJ = ZDP(J)                                          00003990
ISN 0283      5212 IF(M.EQ.0.AND.N.EQ.0) GO TO 5210                       00004000
              C                                                           00004010
              C    IF NOT,AT LEAST ONE BEAM END CONNECTS TO A NODE POINT RATHER  00004020
              C    THAN A MASS POINT.                                     00004030
              C                                                           00004040
              C    FIRST CHECK END I.                                     00004050
              C                                                           00004060
ISN 0285           IF(M.EQ.0) GO TO 5220                                  00004070
ISN 0287           DO 5230 JJ=1,NNP                                       00004080
ISN 0288           IF(I.EQ.INP(JJ).AND.M.EQ.MNP(JJ)) GO TO 5240           00004090
ISN 0290      5230 CONTINUE                                               00004100
ISN 0291      5240 XDPI = XNPDP(JJ)                                       00004110
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ISN 0292          YDPI = YNPDP(JJ)
ISN 0293          ZDPI = ZNPDP(JJ)
ISN 0294     5220 IF(N.EQ.0) GO TO 5210
ISN 0296          DO 5260 JJ=1,NNP
ISN 0297          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5270
ISN 0299     5260 CONTINUE
ISN 0300     5270 XDPJ = XNPDP(JJ)
ISN 0301          YDPJ = YNPDP(JJ)
ISN 0302          ZDPJ = ZNPDP(JJ)
ISN 0303     5210 IF(J.NE.0) GO TO 5299
            C
            C     FOR A SYMMETRICAL MODEL,DATA FOR POINT J DOES NOT EXIST.
            C
ISN 0305          XLB(IJ) = 2.*ABS(YDPI)
ISN 0306          GO TO 5054
ISN 0307     5299 DELXDP = XDPJ-XDPI
ISN 0308          DELYDP = YDPJ-YDPI
ISN 0309          DELZDP = ZDPJ-ZDPI
ISN 0310          XLB(IJ) = SQRT(DELXDP*DELXDP+DELYDP*DELYDP+DELZDP*DELZDP)
ISN 0311     5054 CONTINUE
ISN 0312          PRINT 5301
ISN 0313     5301 FORMAT(//,1X,'MATERIAL PROPERTIES')
ISN 0314          PRINT 5309
ISN 0315     5309 FORMAT(//,2X,'MATERIAL',5X,'MODULUS OF',10X,
                 1 'MODULUS OF',10X,'TENSION',10X,'COMPRESS.',11X,
                 2 'SHEAR',/4X,'NO.',8X,'ELASTICITY',
                 3 11X,'RIGIDITY',11X,'STRESS',13X,'STRESS',11X,'STRESS',/)
ISN 0316          PRINT 5310,(IJ,EE(IJ),GG(IJ),STENS(IJ),SCOMP(IJ),
                 1 SHEAR(IJ),IJ=1,10)
ISN 0317     5310 FORMAT(4X,I2,7X,1PE12.4,8X,E12.4,9X,0PF8.0,10X,F8.0,10X,F8.0)
ISN 0318          IF(NMTL.EQ.0) GO TO 200
ISN 0320          DO 2 LL=1,NMTL
ISN 0321          IJ = IBUF1(LL)
ISN 0322          PRINT 5310,IJ,EE(IJ),GG(IJ),STENS(IJ),SCOMP(IJ),SHEAR(IJ)
ISN 0323        2 CONTINUE
            C     COMPUTE STIFFNESS MATRIX
ISN 0324      200 DO 5307 IJ=1,NB
ISN 0325          IF(NKMVEC(IJ).NE.0) GO TO 5307
ISN 0327          E(IJ)=EE(MC(IJ))
ISN 0328          G(IJ)=GG(MC(IJ))
ISN 0329          EOL = E(IJ)/XLB(IJ)
ISN 0330          EOL2 = EOL/XLB(IJ)
ISN 0331          EOL3 = EOL2/XLB(IJ)
            C
            C  FOR MAN AND DRI TYPE ELEMENTS (TYPES 9 AND 10), CALCULATE AREA
            C  AND DAMPING. THESE OVERRIDE ANY INPUT VALUES.
            C
ISN 0332          IF(MC(IJ).EQ.9) GO TO 30
ISN 0334          IF(MC(IJ).EQ.10) GO TO 40
ISN 0336          GO TO 100
            C
            C  MAN ELEMENT.
            C
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ISN 0337      30 AA(IJ) = 10.2276E-6*XLB(IJ)*WGT(JG(IJ))
ISN 0338         CBAR(IJ) = 0.3*SQRT(1. + WGT(JG(IJ))/WGT(IG(IJ)) )
ISN 0339         GO TO 100
            C
            C  DRI ELEMENT.
            C
ISN 0340      40 AA(IJ) = 6.5456E-6*XLB(IJ)*WGT(JG(IJ))
ISN 0341         CBAR(IJ) = 0.22*SQRT(1. + WGT(JG(IJ))/WGT(IG(IJ)) )
ISN 0342         IJPR(IJ) = 1
ISN 0343     100 XK3(1,1,IJ) = EOL*AA(IJ)
ISN 0344         XK3(2,2,IJ) = EOL3*12.*ZZ(IJ)
ISN 0345         XK3(3,3,IJ) = EOL3*12.*YY(IJ)
ISN 0346         XK3(4,4,IJ) = G(IJ)*XJ(IJ)/XLB(IJ)
ISN 0347         XK3(5,5,IJ) = EOL*4.*YY(IJ)
ISN 0348         XK3(6,6,IJ) = EOL*4.*ZZ(IJ)
ISN 0349         XK3(2,6,IJ) = EOL2*(-6.)*ZZ(IJ)
ISN 0350         XK3(5,3,IJ) = EOL2*6.*YY(IJ)
ISN 0351         XK3(3,5,IJ) = EOL2*6.*YY(IJ)
ISN 0352         XK3(6,2,IJ) = EOL2*(-6.)*ZZ(IJ)
ISN 0353    5307 CONTINUE
            C
            C     CARDS 0601 AND UP
            C
ISN 0354         PRINT 5308
ISN 0355    5308 FORMAT(//,1X,'INTERNAL BEAM DATA')
ISN 0356         PRINT 5302
ISN 0357    5302 FORMAT(//,55X,'DISTANCES FROM NEUTRAL',30X,'M',/,55X,
                1 'AXIS TO EXTREME FIBRES TORSION',13X,'DAMPING  T',/,7X,'BEAM',
                2 8X,'AREA',9X,'MOMENTS OF INERTIA',7X,'ZBIJ AXIS YBIJ AXIS ',
                3 'PARAMETER  LENGTH',5X,'RATIO   L P-CODES      BEAM',/
                4 109X,'Y Z Y Z')
ISN 0358         PRINT 5303
ISN 0359    5303 FORMAT(2X,'IJ  I  J  M  N    A',8X,'IYY',7X,'IZZ',
                1 8X,'JX',8X,'Z1',8X,'Z2',8X,'XIQ',6X,'XLB',7X,'CBAR   ',
                2 'MC I I J J IJ  I  J  M  N')
ISN 0360         PRINT 5304,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),AA(IJ),YY(IJ),
                1 ZZ(IJ),XJ(IJ),Z1(IJ),Z2(IJ),XIQ(IJ),XLB(IJ),CBAR(IJ),
                2 MC(IJ),PY(IJ),PZ(IJ),PYJ(IJ),PZJ(IJ),IJ,IG(IJ),JG(IJ),
                3 MG(IJ),NG(IJ),IJ=1,NB)
ISN 0361    5304 FORMAT(1X,5I3,1P9E10.3,5I2,5I3)
            C
            C  UNSYMMETRICAL BEAM CARDS.
            C
ISN 0362         IF(NUB.EQ.0) GO TO 4050
ISN 0364         PRINT 4022
ISN 0365    4022 FORMAT(//,1X,'UNSYMMETRICAL BEAM DATA')
ISN 0366         PRINT 4024
ISN 0367    4024 FORMAT(/,20X,'TENSION-',/,18X,'COMPRESSION',/,6X,
                1       'BEAM',11X,'FLAG',5X,'DEADBAND')
ISN 0368         PRINT 4026
ISN 0369    4026 FORMAT(/,2X,'IJ  I  J  M  N',5X,'IJUB',8X,'DB')
ISN 0370         DO 4028 IJ=1,NB
ISN 0371         IF(IJUB(IJ).EQ.0) GO TO 4028
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ISN 0373          PRINT 4030,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),IJUB(IJ),DB(IJ)          00005180
ISN 0374     4030 FORMAT(1X,5I3,I8,4X,1P1E10.3)                                       00005190
ISN 0375     4028 CONTINUE                                                            00005200
            C                                                                         00005210
            C      PINNED-END BEAMS AND PLASTIC HINGES                                00005220
            C                                                                         00005230
ISN 0376     4050 IF(NPIN.EQ.0) GO TO 4020                                            00005240
ISN 0378          PRINT 4052                                                          00005250
ISN 0379     4052 FORMAT(//,1X,'PLASTIC HINGE AND END-FIXITY DATA')                   00005260
ISN 0380          PRINT 4053                                                          00005270
ISN 0381     4053 FORMAT(/,6X,'BEAM',7X,'P-CODES',13X,'SHAPE FACTORS',25X,'PLASTIC',00005280
                 1 1X,'HINGE MOMENTS')                                                00005290
ISN 0382          PRINT 4054                                                          00005300
ISN 0383     4054 FORMAT(/,2X,'IJ  I  J  M  N IYIZJYJZ',4X,'SF35',4X,'SF26',4X,       00005310
                 1 'SF35J',3X,'SF26J',3X,'PLM35',7X,'PLM26',7X,'PLM35J',6X,'PLM26J')00005320
ISN 0384     4055 FORMAT(1X,5I3,1X,4I2,3X,4(F6.3,2X),4(1P1E10.3,2X))                  00005330
ISN 0385          DO 4056 IJ=1,NB                                                     00005340
ISN 0386          IF(PY(IJ).EQ.0 .AND.PZ(IJ).EQ.0.AND.PYJ(IJ).EQ.0.AND.               00005350
                 1 PZJ(IJ).EQ.0) GO TO 4056                                           00005360
ISN 0388          PLM26(IJ)=SF26(IJ)*STENS(MC(IJ))*ZZ(IJ)/Z2(IJ)                      00005370
ISN 0389          PLM35(IJ)=SF35(IJ)*STENS(MC(IJ))*YY(IJ)/Z1(IJ)                      00005380
ISN 0390          PLM26J(IJ)=SF26J(IJ)*STENS(MC(IJ))*ZZ(IJ)/Z2(IJ)                    00005390
ISN 0391          PLM35J(IJ)=SF35J(IJ)*STENS(MC(IJ))*YY(IJ)/Z1(IJ)                    00005400
ISN 0392          I=IG(IJ)                                                            00005410
ISN 0393          J=JG(IJ)                                                            00005420
ISN 0394          M=MG(IJ)                                                            00005430
ISN 0395          N=NG(IJ)                                                            00005440
ISN 0396          PRINT 4055,IJ,I,J,M,N,PY(IJ),PZ(IJ),PYJ(IJ),PZJ(IJ),SF35(IJ),       00005450
                 1 SF26(IJ),SF35J(IJ),SF26J(IJ),PLM35(IJ),PLM26(IJ),PLM35J(IJ),       00005460
                 2 PLM26J(IJ)                                                         00005470
ISN 0397     4056 CONTINUE                                                            00005480
            C                                                                         00005490
            C     CARDS 0700                                                          00005500
            C                                                                         00005510
ISN 0398     4020 IF(NOLEO.EQ.0) GO TO 4021                                           00005520
ISN 0400          PRINT 4031                                                          00005530
ISN 0401     4031 FORMAT(///,1X,'OLEO STRUT BEAM DATA'//)                             00005540
ISN 0402          PRINT 4032                                                          00005550
ISN 0403     4032 FORMAT( 20X,'BEAM AIR CURVE PARAMETERS')                            00005560
ISN 0404          PRINT 4033                                                          00005570
ISN 0405     4033 FORMAT(/2X,'IJ  I  J  M  N',7X,'EOLEO',7X,'FAO',7X,'FAA',5X,        00005580
                 1 'EXPOLE',5X,'YMAX')                                                00005590
ISN 0406          DO 4042 J=1,NOLEO                                                   00005600
ISN 0407          DO 4041 IJ=1,NB                                                     00005610
ISN 0408          IF(IGOLEO(J).EQ.IG(IJ).AND.JGOLEO(J).EQ.JG(IJ).AND.MGOLEO(J)        00005620
                 1 .EQ.MG(IJ).AND.NGOLEO(J).EQ.NG(IJ)) GO TO 4045                     00005630
ISN 0410     4041 CONTINUE                                                            00005640
ISN 0411     4045 PRINT 4034,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),EOLEO(J),FAO(J),          00005650
                 1 FAA(J),EXPOLE(J),YMAX(J)                                           00005660
ISN 0412     4034 FORMAT(1X,5I3,5X,1P5E10.3)                                          00005670
ISN 0413     4042 CONTINUE                                                            00005680
ISN 0414          PRINT 4035                                                          00005690
ISN 0415     4035 FORMAT(/20X,'BEAM DAMPING CONSTANTS,COULOMB FRICTION AND LINEAR '   00005700
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                    1 'SPRINGS (EXTENSION&COMPRESSION)')
ISN 0416              PRINT 4036
ISN 0417         4036 FORMAT(/2X,'IJ  I  J  M  N',8X,'BOLEO',4X,'BROLEO',5X,'XKEXT',
                    1 5X,'XKCOMP',4X, FCOUL')
ISN 0418              DO 4044 J=1,NOLEO
ISN 0419              DO 4043 IJ=1,NB
ISN 0420              IF(IGOLEO(J).EQ.IG(IJ).AND.JGOLEO(J).EQ.JG(IJ).AND.MGOLEO(J)
                    1 .EQ.MG(IJ).AND.NGOLEO(J).EQ.NG(IJ)) GO TO 4046
ISN 0422         4043 CONTINUE
ISN 0423         4046 PRINT 4034,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),BOLEO(J),BROLEO(J),
                    1 XKEXT(J),XKCOMP(J),FCOUL(J)
ISN 0424         4044 CONTINUE
ISN 0425         4021 IF(NLB.EQ.0) GO TO 5540
ISN 0427              PRINT 4014
ISN 0428         4014 FORMAT(///,1X,'NONLINEAR BEAM DATA',//)
ISN 0429              PRINT 4015
ISN 0430         4015 FORMAT(42X,'STANDARD',9X,'LINEAR',7X,'BOTTOMING',/,
                    1 13X,'BEAM',13X,'DIRECTION',3X,'TABLE NO.',6X,'DEFLECTION',5X,
                    2 'DEFLECTION',/)
ISN 0431              PRINT 5930
ISN 0432         5930 FORMAT(4X,'IJ',4X,'I',4X,'J',4X,'M',4X,'N',8X,'L',
                    1 11X,'NP',12X,'LDP',12X,'LDP1')
ISN 0433              PRINT 5940,(IJSAVE(I),IQ(I),JQ(I),MQ(I),NQ(I),LQ(I),
                    1 NPQ(I),LDP(I),LDP1(I),I=1,NLB)
ISN 0434         5940 FORMAT(1X,5I5,4X,I5,8X,I5,5X,1P2E15.5)
ISN 0435              K = -14
ISN 0436              DO 5070 I = 1,NLB
ISN 0437              NP = NPQ(I)
ISN 0438              IF(NP.LE.15) GO TO 5055
                C*****TOO MANY POINTS IN KR TABLE, ABORT
ISN 0440              PRINT 5980, NP,I
ISN 0441              STOP
ISN 0442         5980 FORMAT(1H1,'8. ',I5,' POINTS IN KR TABLE',I3,' (MAX IS 15)')
                C*****SET CHUG TO 1,16,31,...
ISN 0443         5055 K = K+15
ISN 0444              CHUG(I) = K
ISN 0445              ICH = CHUG(I)-1
                C     LDP = LINEAR DEFLECTION POINT
                C        NPQ.EQ.5,6,7,8,OR 9 COMPUTE KR'S
                C        NPQ.EQ.10 INPUT KR'S
                C        NPQ.LT.5 ERROR
ISN 0446              IF(NP.GE.10) GO TO 5082
ISN 0448              KR(ICH+1) = 1.
ISN 0449              KR(ICH+2) = 1.
ISN 0450              KR(ICH+5) = 0.
ISN 0451              KR(ICH+6) = 0.
ISN 0452              KR(ICH+7) = 0.
ISN 0453              KR(ICH+8) = 0.
ISN 0454              XKR(ICH+1) = 0.
ISN 0465              XKR(ICH+2) = LDP(I)
ISN 0456              XKR(ICH+3) = 1.001*LDP(I)
ISN 0457              XKR(ICH+6) = 10.*LDP(I)
ISN 0458              GO TO (5087,5087,5087,5087,5083,5084,5085,5086,5091,5082),NP
```

```
ISN 0459      5087 PRINT 5088,NP                                              00006240
ISN 0460      5088 FORMAT(1X // '9. NUMBER OF LINEAR DEFLECTION POINTS NOT',  00006250
                  *     ' ACCEPTABLE VALUE = ',I2)                            00006260
ISN 0461           STOP                                                       00006270
ISN 0462      5083 KR(ICH+3) = 0.                                             00006280
ISN 0463           KR(ICH+4) = 0.                                             00006290
ISN 0464           XKR(ICH+4) = 10.*LDP(I)                                    00006300
ISN 0465           XKR(ICH+5) = 20.*LDP(I)                                    00006310
ISN 0466           GO TO 5082                                                 00006320
ISN 0467      5084 KR(ICH+3) = -.25                                           00006330
ISN 0468           KR(ICH+4) = -.25                                           00006340
ISN 0469           XKR(ICH+4) =  4.*LDP(I)                                    00006350
ISN 0470           XKR(ICH+5) = 4.001*LDP(I)                                  00006360
ISN 0471           GO TO 5082                                                 00006370
ISN 0472      5085 KR(ICH+3) = -.5                                            00006380
ISN 0473           KR(ICH+4) = -.5                                            00006390
ISN 0474           XKR(ICH+4) =  3.*LDP(I)                                    00006400
ISN 0475           XKR(ICH+5) = 3.001*LDP(I)                                  00006410
ISN 0476           XKR(ICH+7) = 20.*LDP(I)                                    00006420
ISN 0477           GO TO 5082                                                 00006430
ISN 0478      5086 KR(ICH+3) = -1.                                            00006440
ISN 0479           KR(ICH+4) = -1.                                            00006450
ISN 0480           XKR(ICH+4) =  2.*LDP(I)                                    00006460
ISN 0481           XKR(ICH+5) = 2.001*LDP(I)                                  00006470
ISN 0482           XKR(ICH+7) = 15.*LDP(I)                                    00006480
ISN 0483           XKR(ICH+8) = 20.*LDP(I)                                    00006490
ISN 0484           GO TO 5082                                                 00006500
ISN 0485      5091 KR(ICH+3) = -1.                                            00006510
ISN 0486           KR(ICH+4) = -1.                                            00006520
ISN 0487           KR(ICH+7) =  1.                                            00006530
ISN 0488           KR(ICH+8) =  1.                                            00006540
ISN 0489           KR(ICH+9) =  1.                                            00006550
ISN 0490           XKR(ICH+4) = 2.*LDP(I)                                     00006560
ISN 0491           XKR(ICH+5) = 2.001*LDP(I)                                  00006570
ISN 0492           XKR(ICH+6) = LDP1(I)                                       00006580
ISN 0493           XKR(ICH+7) = 1.001*LDP1(I)                                 00006590
ISN 0494           XKR(ICH+8) = 20.*LDP1(I)                                   00006600
ISN 0495           XKR(ICH+9) = 30.*LDP1(I)                                   00006610
ISN 0496           GO TO 5082                                                 00006620
              C                                                               00006630
              C    CARDS 0800                                                 00006640
              C                                                               00006650
ISN 0497      5082 PRINT 5960,IQ(I),JQ(I),MQ(I),NQ(I),LQ(I)                   00006660
ISN 0498      5960 FORMAT(1H0,'KR TABLE FOR I,J,M,N,L =',5I5)                 00006670
ISN 0499           PRINT5970, (J,XKR(ICH+J),KR(ICH+J),J=1,NP)                 00006680
ISN 0500      5970 FORMAT(1H ,I3,1P2E15.5)                                    00006690
              C*****COMPUTE SLOPES AND INTERCEPTS                             00006700
ISN 0501           NPM1 = NP-1                                                00006710
ISN 0502           DO 5080 J = 1,NPM1                                         00006720
ISN 0503           SLOPE = (KR(ICH+J)-KR(ICH+J+1))/(XKR(ICH+J)-XKR(ICH+J+1))  00006730
ISN 0504           XKS(ICH+J) = SLOPE                                         00006740
ISN 0505      5080 XKI(ICH+J) = KR(ICH+J)-SLOPE*XKR(ICH+J)                    00006750
              C*****MOVE ENDPOINTS 'WAY OUT                                   00006760
```

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ISN 0506          XKR(ICH+1) = -1.E35                                       00006770
ISN 0507          XKR(ICH+NP) = 1.E35                                       00006780
ISN 0508     5070 CONTINUE                                                  00006790
            C                                                               00006800
            C     CARDS 1000 DELETED  6/4/77                                00006810
            C                                                               00006820
            C     CARD 1100                                                 00006830
            C                                                               00006840
ISN 0509     5540 IF(MVP.EQ.0) GO TO 5065                                   00006850
ISN 0511          PRINT 4016                                                00006860
ISN 0512     4016 FORMAT(//,1X,'VOLUME PENETRATION DATA',/)                 00006870
ISN 0513          PRINT 5538,MVP                                            00006880
ISN 0514     5538 FORMAT(1X,'MASS USED TO IDENTIFY CONTROL VOLUME = ',I3)   00006890
ISN 0515          PRINT 4017                                                00006900
ISN 0516     4017 FORMAT(1X,'DISTANCE FROM MASS MEASURED ALONG POSITIVE (P) AND NEGA00006910
                 1TIVE (N) AXES')                                           00006920
ISN 0517          PRINT 5530                                                00006930
ISN 0518     5530 FORMAT(7X,'XN',14X,'XP',14X,'YN',14X,'YP',14X,'ZN',14X,'ZP')  00006940
ISN 0519          PRINT 5522, XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR           00006950
ISN 0520     5522 FORMAT(1X,1P6E15.5)                                       00006960
            C                                                               00006970
            C     CARDS 1101 AND UP                                         00006980
            C                                                               00006990
ISN 0521     5065 IF(NDRI.EQ.0) GO TO 5056                                  00007000
ISN 0523          PRINT 5531                                                00007010
ISN 0524     5531 FORMAT(//1X,'DRI ELEMENTS',//,2X,'I',2X,'J')              00007020
ISN 0525          JDRI = 2*NDRI                                             00007030
ISN 0526          PRINT 5532,(IJPRT(J),J=1,JDRI)                            00007040
ISN 0527     5532 FORMAT(2I3)                                               00007050
            C                                                               00007060
            C     CARDS 1200                                                00007070
            C                                                               00007080
ISN 0528     5056 IF(NVCH.EQ.0) GO TO 6000                                  00007090
ISN 0530          PRINT 5601                                                00007100
ISN 0531     5601 FORMAT(//,1X,'VOLUME CHANGE DATA',/)                      00007110
ISN 0532          FLIPP = 0.                                                00007120
ISN 0533          DO 5620 I=1,NVCH                                          00007130
ISN 0534          PRINT 5607                                                00007140
ISN 0535     5607 FORMAT(9X,'MASS',/,1X,'POINT',2X,'NUMBER',14X,            00007150
                 1 'MASS COORDINATES',/,11X,'I',8X,3HX'',12X,3HY'',12X,3HZ'')  00007160
ISN 0536          DO 5621 K=1,8                                             00007170
ISN 0537          J = INBUFF(I,K)                                           00007180
ISN 0538          IF(J.NE.0) GO TO 5623                                     00007190
ISN 0540          J = INBUFF(I,K-1)                                         00007200
ISN 0541          YDP(J) = -YDP(J)                                          00007210
ISN 0542          FLIPP = 1.                                                00007220
ISN 0543     5623 XP(K) = XDP(J)                                            00007230
ISN 0544          YP(K) = YDP(J)                                            00007240
ISN 0545          ZP(K) = ZDP(J)                                            00007250
ISN 0546          IF(FLIPP.NE.1.) GO TO 5621                                00007260
ISN 0548          YDP(J) = -YDP(J)                                          00007270
ISN 0549          FLIPP = 0.                                                00007280
ISN 0550     5621 PRINT 5622,K,J,XP(K),YP(K),ZP(K)                          00007290
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ISN 0551      5622 FORMAT(1X,I3,I8,1P3E15.5)                                     00007300
ISN 0552           AVG1     = (XP(1)+XP(2)+XP(5)+XP(6))*.25                      00007310
ISN 0553           AVG2     = (XP(3)+XP(4)+XP(7)+XP(8))*.25                      00007320
ISN 0554           DLX = -AVG1+AVG2                                              00007330
ISN 0555           AVG2 = (YP(2)+YP(4)+YP(6)+YP(8))*.25                          00007340
ISN 0556           AVG1 = (YP(1)+YP(5)+YP(3)+YP(7))*.25                          00007350
ISN 0557           DLY =  AVG1-AVG2                                              00007360
ISN 0558           AVG1     = (ZP(1)+ZP(2)+ZP(3)+ZP(4))*.25                      00007370
ISN 0559           AVG2     = (ZP(5)+ZP(6)+ZP(7)+ZP(8))*.25                      00007380
ISN 0560           DLZ = AVG1-AVG2                                               00007390
ISN 0561           PRINT 5604                                                    00007400
ISN 0562      5604 FORMAT(//,16X,'VOLUME SIDE LENGTHS',13X,'INITIAL VOLUME',//,  00007410
                  1 8X,'DELX',11X,'DELY',11X,'DELZ',11X,'VZERO')                 00007420
ISN 0563           VZERO(I) = DLX*DLY*DLZ                                        00007430
ISN 0564           PRINT 5605,DLX,DLY,DLZ,VZERO(I)                               00007440
ISN 0565      5605 FORMAT(1X,1P4E15.5,//)                                        00007450
ISN 0566           VOLENZ(I,1) = DLX                                             00007460
ISN 0567           VOLENZ(I,2) = DLY                                             00007470
ISN 0568           VOLENZ(I,3) = DLZ                                             00007480
ISN 0569      5620 CONTINUE                                                      00007490
              C                                                                  00007500
              C    CARDS 1300                                                    00007510
              C                                                                  00007520
ISN 0570      6000 IF(NVBM.EQ.0) GO TO 5178                                      00007530
ISN 0572           PRINT 5525                                                    00007540
ISN 0573      5525 FORMAT(/ ,1X,'NON-STANDARD MAXIMUM DEFLECTIONS',/,            00007550
                  1 36X,'MAXIMUM DEFLECTIONS',/,4X,'BEAM',31X,'VMAX(I,J,L) L=',/, 00007560
                  2 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',                         00007570
                  3 5X,'1',11X,'2',11X,'3',11X,'4',                              00007580
                  4 11X,'5',11X,'6',/)                                           00007590
ISN 0574           DO 5170 JI=1,NVBM                                             00007600
ISN 0575           I = IG(IJVM(JI))                                              00007610
ISN 0576           J = JG(IJVM(JI))                                              00007620
ISN 0577           M = MG(IJVM(JI))                                              00007630
ISN 0578           N = NG(IJVM(JI))                                              00007640
ISN 0579           DO 5171 IJ=1,NB                                               00007650
ISN 0580           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.                           00007660
                  1    M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5172                   00007670
ISN 0582      5171 CONTINUE                                                      00007680
ISN 0583      5172 PRINT 5190,IJ,I,J,M,N,(VMAX2(L,IJ),L=1,6)                     00007690
ISN 0584      5190 FORMAT(1X,5I3,1P6E12.4)                                       00007700
ISN 0585      5170 CONTINUE                                                      00007710
ISN 0586      5178 IF(NVBMN.EQ.0) GO TO 5191                                     00007720
ISN 0588           PRINT 5536                                                    00007730
ISN 0589      5536 FORMAT(/1X,'NON-STANDARD MAXIMUM NEGATIVE DEFLECTION',/,      00007740
                  1 36X,'MAXIMUM DEFLECTIONS',/,4X,'BEAM',31X,'VMAXN(I,J,L) L=',/, 00007750
                  2 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',                         00007760
                  3 5X,'1',11X,'2',11X,'3',11X,'4',11X,'5',11X,'6'/)             00007770
ISN 0590           DO 5192 JI=1,NVBMN                                            00007780
ISN 0591           I=IG(IJVMN(JI))                                               00007790
ISN 0592           J=JG(IJVMN(JI))                                               00007800
ISN 0593           M=MG(IJVMN(JI))                                               00007810
ISN 0594           N=NG(IJVMN(JI))                                               00007820
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ISN 0595          DO 5193 IJ=1,NB                                              00007830
ISN 0596          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.                          00007840
                 1 M.EQ.MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5194                     00007850
ISN 0598     5193 CONTINUE                                                     00007860
ISN 0599     5194 PRINT 5190,IJ,I,J,M,N,(VMAX3(L,IJ),L=1,6)                    00007870
ISN 0600     5192 CONTINUE                                                     00007880
ISN 0601     5191 IF(NFBM.EQ.0) GO TO 5199                                     00007890
ISN 0603          PRINT 5526                                                   00007900
ISN 0604     5526 FORMAT(/,1X,'NON-STANDARD MAXIMUM FORCES',/,36X,'MAXIMUM',   00007910
                 16X,'FORCES',/,4X,'BEAM',31X,'FMAX(I,J,L) L=',/               00007920
                 22X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'1',11X,'2',11X,'3',  00007930
                 311X,'4',11X,'5',11X,'6',/)                                   00007940
ISN 0605          DO 5180 JI=1,NFBM                                            00007950
ISN 0606          I = IG(IJFM(JI))                                             00007960
ISN 0607          J = JG(IJFM(JI))                                             00007970
ISN 0608          M = MG(IJFM(JI))                                             00007980
ISN 0609          N = NG(IJFM(JI))                                             00007990
ISN 0610          DO 5181 IJ=1,NB                                              00008000
ISN 0611          IF (I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.                    00008010
                 1MG(IJ).AND.N.EQ.NG(IJ)) GO TO 5182                           00008020
ISN 0613     5181 CONTINUE                                                     00008030
ISN 0614     5182 PRINT 5190,IJ,I,J,M,N,(FMAX2(L,IJ),L=1,6)                    00008040
ISN 0615     5180 CONTINUE                                                     00008050
ISN 0616     5199 IF(NFBMN.EQ.0) GO TO 6001                                    00008060
ISN 0618          PRINT 5537                                                   00008070
ISN 0619     5537 FORMAT(/,1X,'NON-STANDARD MAXIMUM NEGATIVE FORCES',/,        00008080
                 1 36X,'MAXIMUM',6X,'FORCES',/,4X,'BEAM',31X,'FMAXN(I,J,L) L=',/ 00008090
                 2 ,2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'1',11X,'2',11X,'3', 00008100
                 3 11X,'4',11X,'5',11X,'6',/)                                  00008110
ISN 0620          DO 5195 JI=1,NFBMN                                           00008120
ISN 0621          I=IG(IJFMN(JI))                                              00008130
ISN 0622          J=JG(IJFMN(JI))                                              00008140
ISN 0623          M=MG(IJFMN(JI))                                              00008150
ISN 0624          N=NG(IJFMN(JI))                                              00008160
ISN 0625          DO 5197 IJ=1,NB                                              00008170
ISN 0626          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.          00008180
                 1 N.EQ.NG(IJ)) GO TO 5196                                     00008190
ISN 0628     5197 CONTINUE                                                     00008200
ISN 0629     5196 PRINT 5190,IJ,I,J,M,N,(FMAX3(L,IJ),L=1,6)                    00008210
ISN 0630     5195 CONTINUE                                                     00008220
            C                                                                  00008230
            C     CARDS 1400                                                   00008240
            C                                                                  00008250
ISN 0631     6001 IF(NHI.EQ.0) GO TO 6002                                      00008260
ISN 0633          PRINT 4006                                                   00008270
ISN 0634     4006 FORMAT(//,1X,'MASSES HAVING NONZERO ANGULAR MOMENTA (HE),',/, 00008280
                 1 1X,'CROSS PRODUCTS OF INERTIA (IXY,IYZ,IXZ)',/,             00008290
                 2 1X,'OR LIFT CONSTANTS (LC)',/)                              00008300
ISN 0635          PRINT 5512                                                   00008310
ISN 0636     5512 FORMAT(5X,'I',6X,'LC',10X,'HEX',9X,'HEY',9X,'HEZ',9X,'IXY',9X, 00008320
                 1 'IYZ',9X,'IXZ')                                             00008330
ISN 0637          DO 5120 I = 1,NHI                                            00008340
ISN 0638          PRINT 5508,INBUF(I),ALIFT(INBUF(I)),HEX(INBUF(I)),HEY(INBUF(I)), 00008350
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                     IHEZ(INBUF(I)),XYI(INBUF(I)),YZI(INBUF(I)),XZI(INBUF(I))
ISN 0639      5508 FORMAT(1X,I5,1P7E12.4)
ISN 0640      5120 CONTINUE
              C
              C    CARDS 1500
              C
ISN 0641      6002 IF(NPH.EQ.0) GO TO 6003
ISN 0643           DO 5550 J=1,NPH
ISN 0644           PRINT 5570
ISN 0645      5570 FORMAT(1X,'NONZERO PHIDP,THEDP,PSIDP',/,9X,'I',3X,'PHIDP',10X,
                  1 'THEDP',10X,'PSIDP')
ISN 0646           I = IPHDP(J)
ISN 0647           PRINT 5555,I,PHIDP(I),THEDP(I),PSIDP(I)
ISN 0648      5555 FORMAT(1X,I10,1P3E15.5)
ISN 0649      5550 CONTINUE
              C
              C    CARDS 1600
              C
ISN 0650           PRINT 5571
ISN 0651      5571 FORMAT(1X,'BEAM EULER ANGLES',/,1X,'IJ',2X,'I',2X,'J',3X,
                  1 'PHIIJ',10X,'THEIJ',10X,'PSIIJ')
ISN 0652           DO 5552 J=1,NB
ISN 0653           PRINT 5557,J,IG(J),JG(J),PHIIJ(J),THEIJ(J),PSIIJ(J)
ISN 0654      5557 FORMAT(3I3,1P3E15.5)
ISN 0655      5552 CONTINUE
              C
              C    CARDS 1700,1800
              C
ISN 0656      6003 IF(NACC.EQ.0) GO TO 6005
ISN 0658           PRINT 7001
ISN 0659      7001 FORMAT(//,1X,'ACCELERATION INPUT TABLE DATA')
ISN 0660           PRINT 7006
ISN 0661      7006 FORMAT(/,1X,'MASS LOCATION   DIRECTION   NO. PTS.')
ISN 0662           DO 7010 I=1,NACC
ISN 0663           PRINT 7009,MASSNO(I),DIR(I),NPTS(I)
ISN 0664      7009 FORMAT(6X,I2,12X,I2,9X,I2)
ISN 0665      7010 CONTINUE
ISN 0666           PRINT 7007
ISN 0667      7007 FORMAT(/,1X,'PT',7X,'TIME',11X,'ACCEL')
ISN 0668           L=0
ISN 0669           DO 7002 I=1,NACC
ISN 0670           K=NPTS(I)
ISN 0671           DO 7002 J=1,K
ISN 0672           L=L+1
ISN 0673           PRINT 7008,L,TIM(L),ACCEL(L)
ISN 0674      7008 FORMAT(1X,I2,2(5X,1PE10.3))
ISN 0675      7002 CONTINUE
              C
              C    CARDS 2100
              C
ISN 0676      6005 PRINT 5524
ISN 0677      5524 FORMAT(///,1X,'I,J,M,N',/,1X,'K-MATRIX FOR INTERNAL BEAM IJ')
ISN 0678           DO 5528 IJ=1,NB
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ISN 0679           PRINT 5529,IG(IJ),JG(IJ),MG(IJ),NG(IJ)                   00008890
ISN 0680      5529 FORMAT(1X,4I3)                                           00008900
ISN 0681           PRINT 5533,((XK3(L,K,IJ),L=1,6),K=1,6)                   00008910
ISN 0682      5533 FORMAT(1X,1P6E15.5)                                      00008920
ISN 0683      5528 CONTINUE                                                 00008930
ISN 0684           RETURN                                                   00008940
ISN 0685           END                                                      00008950
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          *****************************************************************************************
          *                                                                                       *
          *                                                                                       *
          *                                                                                       *
          *                                                                                       *
          *                                                                                       *
          *              LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.             *
          *                                                                                       *
          *****************************************************************************************

      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                    SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334IPUT  AT LEVEL 012 AS OF 06/25/79
              C          DATA SET D2332VIU   AT LEVEL 001 AS OF 01/17/78
              C          DATA SET D2332NIU   AT LEVEL 002 AS OF 11/09/77
              C          DATA SET D2332NIU   AT LEVEL 001 AS OF 11/02/77
              C          DATA SET D2332VINPU AT LEVEL 004 AS OF 10/04/77
              C          DATA SET D2332QIU   AT LEVEL 001 AS OF 07/26/77
ISN 0002                SUBROUTINE INPUT
              C
ISN 0003                IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004                REAL*8 KUN,CASEIN,CASOUT,MINDT
ISN 0005                REAL*8 LBAR,MU,KE
ISN 0006                REAL*4 KR(2700),SLOPE,XKS,XKI,XKR,LDP(180),LDP1(180)
ISN 0007                INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150),PTEMP(4)
ISN 0008                INTEGER*4 TITLE(40),BLANK,STOP,RUNIN,RUNOUT
ISN 0009                INTEGER*4 DIR
ISN 0010                INTEGER*2 CHUG,INBUFF,II(40),KK(40),INBUF(80)
ISN 0011                INTEGER*2 IJVM(150),IJFM(150),IJVMN(150),IJFMN(150)
ISN 0012                INTEGER*2 MQ(180),NQ(180)
ISN 0013                INTEGER*2 IQ(180),JQ(180),LQ(180),NPQ(180),NLSFLG,IJPR
ISN 0014                INTEGER*2 N1,NN,IBS,IG,JG
ISN 0015                INTEGER*2 NTOL1,NTOL2,NTOL3
ISN 0016                INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE
ISN 0017                INTEGER*2 IJSAVE(180)
ISN 0018                INTEGER*2 NKMVEC(150)
ISN 0019                INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)
ISN 0020                INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                       *         JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),
                       *         JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),
                       *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0021                DIMENSION G(150),VMAX2(6,150),FMAX2(6,150)
ISN 0022                DIMENSION FMAX3(6,150),VMAX3(6,150),PTEMPM(4)
ISN 0023                DIMENSION XK3(6,6,150)
ISN 0024                DIMENSION IJPRT(14),VMAXT(6),FMAXT(6)
ISN 0025                DIMENSION MASSNO(50),DIR(50),NPTS(50)
ISN 0026                DIMENSION IPHDP(80)
ISN 0027                DIMENSION XNPDP(50),YNPDP(50),ZNPDP(50)
ISN 0028                COMMON/IBALL/ IBUF1(20)
ISN 0029                COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10),
                       *              NMPTS(10),MNUM(50,10),ISCALE(10)
ISN 0030                COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
                       1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
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                  2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),  00000410
                  3 MVP                                                               00000420
ISN 0031           COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),            00000430
                  1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),     00000440
                  2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                      00000450
ISN 0032           COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),        00000460
                  1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)           00000470
ISN 0033           COMMON/DOIN/ CBAR(150)                                             00000480
ISN 0034           COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2),KOUNT        00000490
ISN 0035           COMMON/INCF/ SA(40),SB(40),SF(40),SI(40),XMU(40),XKE(40),          00000500
                  1 XMAX(40),FSPOF(40),FSPOI(40),GFLEX(40),CDAMP(40),PLOWT            00000510
ISN 0036           COMMON/INDEAC/ NACC                                                00000520
ISN 0037           COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),                  00000530
                  1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,                00000540
                  2 XGDOT,YGDOT,ZGDOT                                                 00000550
ISN 0038           COMMON/INIDCP/ YDP(80)                                             00000560
ISN 0039           COMMON/INPR/  NDRI,NSP                                             00000570
ISN 0040           COMMON/INCFIC/ BETA                                                00000580
ISN 0041           COMMON/MACFIN/ TMAX,IPRINT                                         00000590
ISN 0042           COMMON/MCFIII/ SYMFLG                                              00000600
ISN 0043           COMMON/COMNEW/ DAMPC,RUNMOD,PUNMOD                                 00000610
ISN 0044           COMMON/NP00I2/ MG,NG,INP,MNP                                       00000620
ISN 0045           COMMON/NP01I2/ II,KK,MM                                            00000630
ISN 0046           COMMON/NP02I2/ MQ,NQ,IJVM,IJFM,IJVMN,IJFMN                         00000640
ISN 0047           COMMON/NP00I4/ NNP                                                 00000650
ISN 0048           COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP                                   00000660
ISN 0049           COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),         00000670
                  1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),    00000680
                  2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO          00000690
ISN 0050           COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000700
                  1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),             00000710
                  2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),            00000720
                  3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),     00000730
                  4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),   00000740
                  5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,   00000750
                  6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                              00000760
                  7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,              00000770
                  8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),            00000780
                  9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),          00000790
                  A CEIKF(40),                                                        00000800
                  B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                             00000810
                  C NM,NB,I,J,IG(150),JG(150),                                        00000820
                  D N1(900),NN(40),IJPR(150)                                          00000830
ISN 0051           COMMON/IPIC/ NIC                                                   00000840
ISN 0052           COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP                    00000850
ISN 0053           COMMON/UB/ DB(150),IJUB(150),NUB                                   00000860
ISN 0054           COMMON/COMMR8/ G                                                   00000870
ISN 0055           COMMON/COMMR4/ KR     ,LDP    ,LDP1                                00000880
ISN 0056           COMMON/COMMI4/ ND,NVBMN,NFBMN,NHI,NKM,NLB,                         00000890
                  1               NPH    ,NMTL   ,NPTS   ,NVBM   ,IJPRT  ,IPHDP,NFBM  00000900
ISN 0057           COMMON/COMMI2/ IQ             ,JQ             ,LQ     ,NPQ   ,INBUF ,  00000910
                  1               NKMVEC,IJSAVE                                       00000920
ISN 0058           COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3                               00000930
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ISN 0059       COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
              *              JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,
              *              NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0060       COMMON /RESTRT/ CASEIN,RUNIN,MSECIN,CASOUT,RUNOUT,MSCOUT(5)
ISN 0061       COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR
ISN 0062       EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0063       EQUIVALENCE (VMAX(1),VMAX2(1)),(FMAX(1),FMAX2(1))
ISN 0064       EQUIVALENCE (VMAXN(1),VMAX3(1)),(FMAXN(1),FMAX3(1))
ISN 0065       EQUIVALENCE (MASSNO(1),INDEX(1,1))
ISN 0066       EQUIVALENCE (DIR(1),INDEX(1,2))
ISN 0067       DATA STOP/'END '/
ISN 0068       DATA BLANK/'    '/
ISN 0069       SQRT(X) = DSQRT(X)
ISN 0070       ABS(X) = DABS(X)
          C
          C    INITIALIZATION
          C
ISN 0071       DO 1 I=1,150
ISN 0072       NKMVEC(I) = 0
ISN 0073       SF26(I)=0.
ISN 0074       SF35(I)=0.
ISN 0075       SF26J(I)=0.
ISN 0076       SF35J(I)=0.
ISN 0077     1 CONTINUE
ISN 0078       DO 5130 I = 1,MAXNM
ISN 0079       ALIFT(I) = 0.0
ISN 0080       HEX(I) = 0.0
ISN 0081       HEY(I) = 0.0
ISN 0082       HEZ(I) = 0.0
ISN 0083       XYI(I) = 0.0
ISN 0084       YZI(I) = 0.0
ISN 0085       XZI(I) = 0.0
ISN 0086       PHIDP(I) = 0.0
ISN 0087       THEDP(I) = 0.0
ISN 0088       PSIDP(I) = 0.0
ISN 0089  5130 CONTINUE
ISN 0090       MXIGS6 = 6*MAXIGS
ISN 0091       DO 5010 I = 1,MXIGS6
ISN 0092  5010 NLSFLG(I) = 0
          C
          C    CARD 0001,0002
          C
ISN 0093       READ 5100,(TITLE(I),I=1,20)
ISN 0094  5100 FORMAT(20A4)
ISN 0095       IF(TITLE(1).EQ.STOP) RETURN
ISN 0097       READ 5100,(TITLE(I),I=21,40)
ISN 0098       TITLE(19) = BLANK
ISN 0099       TITLE(20) = BLANK
ISN 0100       TITLE(39) = BLANK
ISN 0101       TITLE(40) = BLANK
          C
          C    CARD 0003
          C
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ISN 0102          READ 5100,DUMMY
             C
             C    CARD 0004
             C
ISN 0103          READ 5200,NM,NSP,NB,NLB,NNP,NPIN,NUB,NDRI,NOLEO,NACC,MVP,NVCH,
                 1 NMTL,ND
ISN 0104          READ 5200,NVBM,NFBM,NVBMN,NFBMN,NKM,NHI,NPH,NTOL1,NTOL2,NTOL3,
                 1 NSC,NIC
ISN 0105     5200 FORMAT(14I5,2I1)
             C
             C    NSC EQ.OR LESS 0 THEN NO STRESS CALC.
             C    NIC EQ.OR LESS 0 THEN NO PREL. LOADS/DEFLS IN SUBROUTINE IC
             C
             C    CARDS 0005, 0006
             C
ISN 0106          READ 5203,CASEIN,RUNIN,MSECIN
ISN 0107          READ 5203,CASOUT,RUNOUT,MSCOUT
ISN 0108     5203 FORMAT(A8,2X,6I10)
             C
             C    CARD 0007
             C
ISN 0109          READ 5201,IPRINT,DELTAT,TMAX,PLOWT,FCUT,RUNMOD
ISN 0110          MINDT = 0.1 * DELTAT
ISN 0111          TPRINT = IPRINT * DELTAT
ISN 0112          READ 5201,IVAR,EL,EU,RATMIN,RATMAX
ISN 0113     5201 FORMAT(I10,5E10.0)
             C
             C    CARDS 0008, 0009
             C
ISN 0114          READ 5200,NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP
ISN 0115          IF(NTOL1.NE.0) GO TO 5570
ISN 0117          NTOL1=1
ISN 0118     5570 IF(NTOL2.NE. 0) GO TO 5571
ISN 0120          NTOL2=10
ISN 0121     5571 IF(NTOL3.NE.0) GO TO 5572
ISN 0123          NTOL3=30
             C
             C    NTOL1=ALLOWABLE ENERGY GROWTH TOLERANCE IN PER CENT(%)
             C    NTOL2=ALLOWABLE INDIVIDUAL NEGATIVE ENERGY IN PER CENT(%)
             C    NTOL3=ALLOWABLE MASS DEVIATION TOLERANCE IN PER CENT(%)
             C    NIMP=MASS IMPULSE PRINT 2/1/79
             C
ISN 0124     5572 READ 5200,NMEP,NNEP,NBFP,NBDP,NSTP,NSEP,NENP,NDRP,NPLT,NPFCT
ISN 0125          IPFCT = -1
             C
             C    NSF=STRAIN FORCE,NTF=TOTAL FORCE,NDE=BEAM DEFL.,NSPD=EXT.SPRING
             C    DATA,NED=MASS&BEAM ENERGY PRINT,NS=STRESS PRINT,NRP=
             C    TRANS.ACCEL(UNFILTERED&FILTERED)ONLY
             C    NSF,NTF,NDE,NSPD,NED,NS, EQ. OR LESS THAN 0 NO PRINT
             C    NRP EQ.OR LESS THAN 0 ONLY TRANS.ACCELS PRINT,>0 ALL MASS RESPONSE
             C
             C    NUB=NO.OF UNSYMMETRICAL BEAMS
             C    NMEP,NNEP,NBFP,NBDP,NSTP,NSEP,NDRP ARE  THE HISTORY PLOTS FOR
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                C     MASSPOINTS,NODE POINTS,BEAM FORCES,BEAM DEFLECTIONS,STRESSES,      00002000
                C     EXT.SPRINGS,DRI'S.RESPECTIVELY                                     00002010
                C     NPLT=NO.MASS POSITION PLOTS AT SELECTED INTERVALS                  00002020
                C     NENP=TIME HISTORY PLOT OF STRAIN & DAMPING ENERGY                  00002030
                C                                                                        00002040
ISN 0126              IF(NSC.GT.0) GO TO 5210                                            00002050
ISN 0128              NS=0                                                               00002060
ISN 0129         5210 CONTINUE                                                           00002070
ISN 0130              IF(DELTAT.LE.0.) GO TO 5000                                        00002080
ISN 0132              IF(NM.LE.0) GO TO 5000                                             00002090
                C                                                                        00002100
                C     CARD 0010                                                          00002110
                C                                                                        00002120
ISN 0134              READ 5300,XGDOT,YGDOT,ZGDOT                                        00002130
                C                                                                        00002140
                C     CARD 0011                                                          00002150
                C                                                                        00002160
ISN 0135              READ 5300,PPR,QPR,RPR                                              00002170
                C                                                                        00002180
                C     CARD 0012                                                          00002190
                C                                                                        00002200
ISN 0136              READ 5300,PHIPR,THEPR,PSIPR,XGIN,ZGIN,BETA                         00002210
ISN 0137         5300 FORMAT(6E10.0)                                                     00002220
                C                                                                        00002230
                C     CARDS 0100                                                         00002240
                C                                                                        00002250
ISN 0138              READ 5301,(WGT(I),XDP(I),YDP(I),ZDP(I),XI(I),YI(I),ZI(I),I=1,NM)  00002260
ISN 0139         5301 FORMAT(7E10.0)                                                     00002270
                C                                                                        00002280
                C     CARDS 0200                                                         00002290
                C                                                                        00002300
ISN 0140              IF(NNP.EQ.0) GO TO 5534                                            00002310
ISN 0142              READ 4001,(MNP(I),INP(I),XNPDP(I),YNPDP(I),ZNPDP(I),I=1,NNP)       00002320
ISN 0143         4001 FORMAT(2I5,3E10.0)                                                 00002330
                C                                                                        00002340
                C CLEAR EXTERNAL SPRING FLAGS (AND THE ASSOCIATED DATA ALTHOUGH THIS      00002350
                C SHOULD NOT BE NECESSARY BECAUSE WE ONLY USE IT IF THE FLAG IS 1.       00002360
                C HOWEVER, THEY MUST BE CLEARED FOR THE SEARCH WHICH PRINTS THE INPUT.)  00002370
                C                                                                        00002380
ISN 0144         5534 IF(NSP.EQ.0) GO TO 5535                                            00002390
ISN 0146              DO 5132 IKM=1,NSP                                                  00002400
ISN 0147              XLBAR(IKM) = 0.                                                    00002410
ISN 0148              XMU(IKM) = 0.                                                      00002420
ISN 0149              XKE(IKM) = 0.                                                      00002430
ISN 0150              SI(IKM) = 0.                                                       00002440
ISN 0151              SA(IKM) = 0.                                                       00002450
ISN 0152              SB(IKM) = 0.                                                       00002460
ISN 0153              SF(IKM) = 0.                                                       00002470
ISN 0154              FSPOI(IKM) = 0.                                                    00002480
ISN 0155              FSPOF(IKM) = 0.                                                    00002490
ISN 0156              CDAMP(IKM)=0.                                                      00002500
ISN 0157         5132 CONTINUE                                                           00002510
                C                                                                        00002520
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            C     CARDS 0300                                                        00002530
            C                                                                       00002540
ISN 0158          READ 5810,(MM(J),II(J),KK(J),XLBAR(J),XMU(J),XKE(J),XMAX(J),      00002550
                 1 GFLEX(J),J=1,NSP)                                                00002560
ISN 0159     5810 FORMAT(I2,I3,I5,5E10.0)                                           00002570
            C                                                                       00002580
            C     CARDS 0400                                                        00002590
            C                                                                       00002600
ISN 0160          DO 5160 IKM=1,NSP                                                 00002610
ISN 0161          READ 5301,SI(IKM),SA(IKM),SB(IKM),SF(IKM),FSPOI(IKM),FSPOF(IKM),  00002620
                 1 CDAMP(IKM)                                                       00002630
ISN 0162     5160 CONTINUE                                                          00002640
            C     E=MODULUS OF ELASTICITY,A=AREA,G=MODULUS OF RIGIDITY              00002650
            C     XJ=POLAR MOMENT OF INERTIA,YY=MOMENT OF INERTIA ABOUT THE Y AXIS  00002660
            C     ZZ=MOMENT OF INERTIA ABOUT THE Z AXIS,XLB=MEMBER LENGTH           00002670
            C     YY IS USED WITH (3,5) TERMS (Z,THETA)                             00002680
            C     ZZ IS USED WITH (2,6) TERMS (Y,PSI)                               00002690
            C                                                                       00002700
            C     CARDS 0500                                                        00002710
            C                                                                       00002720
ISN 0163     5535 READ 5306,(MG(IJ),IG(IJ),NG(IJ),JG(IJ),AA(IJ),XJ(IJ),YY(IJ),      00002730
                 1 ZZ(IJ),XIQ(IJ),Z1(IJ),Z2(IJ),MC(IJ),IJ=1,NB)                     00002740
ISN 0164     5306 FORMAT(2(I2,I3),5E10.0,2F5.0,I2)                                  00002750
ISN 0165          DO 6101 IJ=1,NB                                                   00002760
ISN 0166          IF(XJ(IJ).NE.0.0) GO TO 6102                                      00002770
ISN 0168          XJ(IJ)=YY(IJ)+ZZ(IJ)                                              00002780
ISN 0169     6102 PY(IJ) = 0                                                        00002790
ISN 0170          PZ(IJ) = 0                                                        00002800
ISN 0171          PYJ(IJ) = 0                                                       00002810
ISN 0172          PZJ(IJ) = 0                                                       00002820
ISN 0173     6101 CONTINUE                                                          00002830
            C                                                                       00002840
            C     CARDS 0600                                                        00002850
            C                                                                       00002860
ISN 0174          IF(NMTL.EQ.0) GO TO 2                                             00002870
ISN 0176          DO 4 LL=1,NMTL                                                    00002880
ISN 0177          READ 3,K,EE(K),GG(K),STENS(K),SCOMP(K),SHEAR(K)                   00002890
ISN 0178          IBUF1(LL) = K                                                     00002900
ISN 0179        4 CONTINUE                                                          00002910
ISN 0180        3 FORMAT(I5,5X,5E10.0)                                              00002920
            C                                                                       00002930
            C     CARDS 0700                                                        00002940
            C                                                                       00002950
ISN 0181        2 IF(NPIN.EQ.0) GO TO 6112                                          00002960
ISN 0183          DO 6120 JI=1,NPIN                                                 00002970
ISN 0184          READ 6122,M,I,N,J,(PTEMP(K),K=1,4),(PTEMPM(K),K=1,4)              00002980
ISN 0185     6122 FORMAT(2(I2,I3),4I5,4E10.0)                                       00002990
ISN 0186          DO 6124 IJ=1,NB                                                   00003000
ISN 0187          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))   00003010
                 1 GO TO 6126                                                       00003020
ISN 0189     6124 CONTINUE                                                          00003030
ISN 0190     6126 PY(IJ) = PTEMP(1)                                                 00003040
ISN 0191          PZ(IJ) = PTEMP(2)                                                 00003050
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ISN 0192          PYJ(IJ) = PTEMP(3)                                          00003060
ISN 0193          PZJ(IJ) = PTEMP(4)                                          00003070
ISN 0194          SF35(IJ)=PTEMPM(1)                                          00003080
ISN 0195          SF26(IJ)=PTEMPM(2)                                          00003090
ISN 0196          SF35J(IJ)=PTEMPM(3)                                         00003100
ISN 0197          SF26J(IJ)=PTEMPM(4)                                         00003110
ISN 0198     6120 CONTINUE                                                    00003120
            C                                                                 00003130
            C     CARDS 0800                                                  00003140
            C                                                                 00003150
ISN 0199     6112 DO 6111 IJ=1,NB                                             00003160
ISN 0200          IJUB(IJ)=0                                                  00003170
ISN 0201     6111 DB(IJ)=0.                                                   00003180
ISN 0202          IF(NUB.EQ.0) GO TO 6110                                     00003190
ISN 0204          DO 6114 JI=1,NUB                                            00003200
ISN 0205          READ 6116,M,I,N,J,IJTEMP,DBTEMP                             00003210
ISN 0206     6116 FORMAT(2(I2,I3),I5,E10.0)                                   00003220
ISN 0207          DO 6118 IJ=1,NB                                             00003230
ISN 0208          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00003240
                 1 GO TO 6119                                                 00003250
ISN 0210     6118 CONTINUE                                                    00003260
ISN 0211     6119 IJUB(IJ)=IJTEMP                                             00003270
ISN 0212          DB(IJ)=DBTEMP                                               00003280
ISN 0213     6114 CONTINUE                                                    00003290
            C                                                                 00003300
            C     CARD 0900                                                   00003310
            C                                                                 00003320
ISN 0214     6110 IF(NOLEO.EQ.0) GO TO 6210                                   00003330
ISN 0216          READ 5301,ALPHAP                                            00003340
ISN 0217          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),    00003350
                 1 EOLEO(IJ),FAO(IJ),FAA(IJ),EXPOLE(IJ),YMAX(IJ),IJ=1,NOLEO)  00003360
ISN 0218          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),    00003370
                 1 BOLEO(IJ),BROLEO(IJ),XKEXT(IJ),XKCOMP(IJ),FCOUL(IJ),IJ=1,NOLEO)  00003380
ISN 0219     6210 READ 5600,DAMPC                                             00003390
ISN 0220     5600 FORMAT(E10.0)                                               00003400
            C                                                                 00003410
            C      DAMPC=DAMPING COEFF. FOR ALL BEAMS                         00003420
            C      NO STANDARD DAMPC VALUE AS OF 3/79 VALUE MUST BE INPUT     00003430
            C      IF ND.NE.0 SET DESIRED CBAR TO VALUE READ IN               00003440
            C                                                                 00003450
ISN 0221          CDUM=DAMPC                                                  00003460
ISN 0222          DO 5549 IJ=1,NB                                             00003470
ISN 0223     5549 CBAR(IJ) = CDUM                                             00003480
            C                                                                 00003490
            C     CARDS 0901 AND UP                                           00003500
            C                                                                 00003510
ISN 0224          IF(ND.EQ.0) GO TO 5543                                      00003520
ISN 0226          DO 5544 JI=1,ND                                             00003530
ISN 0227          READ 5547,M,I,N,J,CDUM                                      00003540
ISN 0228     5547 FORMAT(2(I2,I3),E10.0)                                      00003550
ISN 0229          DO 5544 IJ=1,NB                                             00003560
ISN 0230          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))  00003570
                 1 CBAR(IJ) = CDUM                                            00003580
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ISN 0232      5544 CONTINUE                                                          00003590
             C                                                                        00003600
             C     CARDS 1000                                                         00003610
             C                                                                        00003620
ISN 0233      5543 IF(NLB.EQ.0) GO TO 5541                                            00003630
ISN 0235           MXTBL1 = MAXTBL+1                                                  00003640
ISN 0236           IF(NLB.GT.MXTBL1) GO TO 5921                                       00003650
             C******KR TABLE INPUT                                                    00003660
             C IN DERIV, TO SEE IF THERE IS A TABLE FOR A PARTICULAR IJL, WE LOOK     00003670
             C AT NLSFLG(IJL) AND IF IT IS NON-ZERO, IT WILL BE THE TABLE NUMBER      00003680
             C FOR THAT IJL.  WE STILL USE SLOPES AND INTERCEPTS FOR THE              00003690
             C INTERPOLATION BUT WE MUST FIND WHICH INTERVAL IN X WE'RE IN.           00003700
             C THIS IS DONE BY KEEPING, FOR EACH TABLE, A POINTER TO THE LOWER X OF   00003710
             C THE INTERVAL WE WERE IN AT THE LAST INTEGRATION STEP                   00003720
             C (INTEGER*2 CHUG(80)) ON THE GROUNDS THAT WE'RE PROBABLY                00003730
             C STILL IN THAT INTERVAL.  IF WE'RE NOT IN THAT INTERVAL, WE CHECK       00003740
             C ONE BY ONE IN THE APPROPRIATE DIRECTION UNTIL WE FIND THE RIGHT        00003750
             C INTERVAL AND WE SAVE THAT IN CHUG AND DO THE INTERPOLATION.            00003760
             C X(I) AND X(NPQ) FOR EACH TABLE ARE REPLACED BY VERY LARGE (E35)        00003770
             C NEGATIVE AND POSITIVE NUMBERS SO THAT WE NEED NEVER CHECK FOR BEING    00003780
             C OUT OF THE TABLE AND ALSO SO WE DON'T EVEN HAVE TO KNOW HOW MANY       00003790
             C POINTS IN THE TABLE.  (IF AN ARGUMENT EXCEEDS 1.E35 WE'LL BOMB         00003800
             C SOONER OR LATER). THIS ALLOWS VERY RAPID TABLE SEARCH AND              00003810
             C INTERPOLATION.                                                         00003820
             C*****INPUT KR TABLE SPECS                                               00003830
             C     DO TO NUMBER OF TABLES INPUT                                       00003840
ISN 0238           DO 5090 I = 1,NLB                                                  00003850
ISN 0239           READ 5900,MQ(I),IQ(I),NQ(I),JQ(I),LQ(I),NPQ(I),LDP(I),LDP1(I)      00003860
ISN 0240      5900 FORMAT(2(I2,I3),2I5,2E10.0)                                        00003870
             C*****HUNT FOR I,J PAIR SO WE CAN STORE NONLINEAR BEAM I IN NLSFLG       00003880
ISN 0241           DO 5030 J = 1,NB                                                   00003890
ISN 0242           IF(IQ(I).EQ.IG(J).AND.JQ(I).EQ.JG(J).AND.MQ(I).EQ.MG(J)            00003900
                  1 .AND.NQ(I).EQ.NG(J)) GO TO 5040                                   00003910
ISN 0244      5030 CONTINUE                                                           00003920
             C*****NO SUCH I,J PAIR, ABORT                                            00003930
ISN 0245           PRINT 5910,IQ(I),JQ(I),MQ(I),NQ(I)                                 00003940
ISN 0246           STOP                                                               00003950
ISN 0247      5910 FORMAT(1H1,'5. NON-EXISTENT I,J PAIR IN KR TABLE SPECS',4I5)       00003960
             C*****FOUND IT                                                           00003970
ISN 0248      5040 NLSFLG(6*(J-1)+LQ(I)) = I                                          00003980
ISN 0249           IJSAVE(I) = J                                                      00003990
ISN 0250      5090 CONTINUE                                                           00004000
ISN 0251           GO TO 5540                                                         00004010
             C*****TOO MANY KR TABLES, ABORT                                          00004020
ISN 0252      5921 PRINT 5920                                                         00004030
ISN 0253           STOP                                                               00004040
ISN 0254      5920 FORMAT(1H1,'6. TOO MANY KR TABLES')                                00004050
             C                                                                        00004060
             C     CARDS 1100                                                         00004070
             C                                                                        00004080
ISN 0255      5540 K = -14                                                            00004090
ISN 0256           DO 5070 I = 1,NLB                                                  00004100
ISN 0257           NP = NPQ(I)                                                        00004110
```

```
ISN 0258         K = K+15
ISN 0259         CHUG(I) = K
ISN 0260         ICH = CHUG(I)-1
ISN 0261         IF(NP.LT.10) GO TO 5070
            C
            C    IF NP.GE.10,WE READ KR TABLE DIRECTLY
            C
ISN 0263         READ 5950,(XKR(ICH+J),KR(ICH+J),J=1,NP)
ISN 0264    5950 FORMAT(2E10.0)
ISN 0265    5070 CONTINUE
            C
            C    CARD 1200
            C
ISN 0266    5541 IF(MVP.EQ.0) GO TO 5065
ISN 0268         READ 5300,XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR
            C
            C    CARDS 1201 AND UP
            C
ISN 0269    5065 DO 5580 IJ=1,NB
ISN 0270         IJPR(IJ) = 0
ISN 0271    5580 CONTINUE
ISN 0272         IF(NDRI.EQ.0) GO TO 5056
ISN 0274         FNDRI = NDRI
ISN 0275         LDRI = FNDRI/7.+.9
ISN 0276         DO 5560 JI=1,LDRI
ISN 0277         READ 5561,(IJPRT(J),J=1,14)
ISN 0278    5561 FORMAT(14I5)
ISN 0279         DO 5560 I=1,7
ISN 0280         DO 5560 IJ=1,NB
ISN 0281         IF(IJPRT(2*I-1).EQ.IG(IJ).AND.IJPRT(2*I).EQ.JG(IJ)) IJPR(IJ) = 1
ISN 0283    5560 CONTINUE
            C
            C    CARDS 1210
            C
ISN 0284    5056 IF(NVCH.EQ.0) GO TO 6000
ISN 0286         DO 5611 I=1,NVCH
ISN 0287         READ 5602,(INBUFF(I,J),J=1,8)
ISN 0288    5602 FORMAT(8I5)
ISN 0289    5611 CONTINUE
            C
            C    CARDS 1300, 1400
            C
            C*****STANDARD VMAX = 100
ISN 0290    6000 DO 5180 I = 1,MXIGS6
ISN 0291    5180 VMAX(I) = 100.0
ISN 0292         IF(NVBM.EQ.0) GO TO 5185
ISN 0294         DO 5170 JI=1,NVBM
ISN 0295         READ 5820,M,I,N,J,(VMAXT(K),K=1,6)
ISN 0296    5820 FORMAT(2(I2,I3),6E10.0)
ISN 0297         DO 5171 IJ=1,NB
ISN 0298         IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).
                1 AND.N.EQ.NG(IJ)) GO TO 5172
ISN 0300    5171 CONTINUE
```

```
ISN 0301      5172 IJVM(JI) = IJ                                                          00004650
ISN 0302           DO 5173 L=1,6                                                          00004660
ISN 0303           VMAX2(L,IJ)=VMAXT(L)                                                   00004670
ISN 0304      5173 CONTINUE                                                               00004680
ISN 0305      5170 CONTINUE                                                               00004690
ISN 0306      5185 DO 5190 I=1,MXIGS6                                                     00004700
ISN 0307      5190 VMAXN(I)=100.0                                                         00004710
ISN 0308           IF(NVBMN.EQ.0) GO TO 5178                                              00004720
ISN 0310           DO 5186 JI=1,NVBMN                                                     00004730
ISN 0311           READ 5820, M,I,N,J,(VMAXT(K),K=1,6)                                    00004740
ISN 0312           DO 5187 IJ=1,NB                                                        00004750
ISN 0313           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))        00004760
                  1 GO TO 5188                                                            00004770
ISN 0315      5187 CONTINUE                                                               00004780
ISN 0316      5188 IJVMN(JI)=IJ                                                           00004790
ISN 0317           DO 5189 L=1,6                                                          00004800
ISN 0318           VMAX3(L,IJ)=VMAXT(L)                                                   00004810
ISN 0319      5189 CONTINUE                                                               00004820
ISN 0320      5186 CONTINUE                                                               00004830
             C     STANDARD FMAX=1.E10                                                    00004840
ISN 0321      5178 DO 5177 I=1,MXIGS6                                                     00004850
ISN 0322      5177 FMAX(I)=1.E10                                                          00004860
ISN 0323           IF(NFBM.EQ.0) GO TO 6100                                               00004870
ISN 0325           DO 5181 JI=1,NFBM                                                      00004880
ISN 0326           READ 5820,M,I,N,J,(FMAXT(K),K=1,6)                                     00004890
ISN 0327           DO 5182 IJ=1,NB                                                        00004900
ISN 0328           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).                        00004910
                  1AND.N.EQ.NG(IJ)) GO TO 5183                                            00004920
ISN 0330      5182 CONTINUE                                                               00004930
ISN 0331      5183 IJFM(JI) = IJ                                                          00004940
ISN 0332           DO 5184 L=1,6                                                          00004950
ISN 0333           FMAX2(L,IJ)=FMAXT(L)                                                   00004960
ISN 0334      5184 CONTINUE                                                               00004970
ISN 0335      5181 CONTINUE                                                               00004980
ISN 0336      6100 DO 6201 I=1,MXIGS6                                                     00004990
ISN 0337      6201 FMAXN(I)=1.E10                                                         00005000
ISN 0338           IF(NFBMN.EQ.0) GO TO 6001                                              00005010
ISN 0340           DO 6202 JI=1,NFBMN                                                     00005020
ISN 0341           READ 5820 ,M,I,N,J,(FMAXT(K),K=1,6)                                    00005030
ISN 0342           DO 6103 IJ=1,NB                                                        00005040
ISN 0343           IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))        00005050
                  1 GO TO 6104                                                            00005060
ISN 0345      6103 CONTINUE                                                               00005070
ISN 0346      6104  IJFMN(JI)=IJ                                                          00005080
ISN 0347           DO 6105 L=1,6                                                          00005090
ISN 0348           FMAX3(L,IJ)=FMAXT(L)                                                   00005100
ISN 0349      6105 CONTINUE                                                               00005110
ISN 0350      6202 CONTINUE                                                               00005120
             C                                                                            00005130
             C     CARDS 1500                                                             00005140
             C                                                                            00005150
ISN 0351      6001 IF(NHI.EQ.0) GO TO 6002                                                00005160
ISN 0353           DO 5120 I = 1,NHI                                                      00005170
```

```
ISN 0354          READ 5800,INBUF(I),ALIFT(INBUF(I)),HEX(INBUF(I)),HEY(INBUF(I)),     00005180
                 1HEZ(INBUF(I)),XYI(INBUF(I)),YZI(INBUF(I)),XZI(INBUF(I))             00005190
ISN 0355     5800 FORMAT(I5,E5.0,6E10.0)                                              00005200
ISN 0356     5120 CONTINUE                                                            00005210
            C                                                                         00005220
            C     CARDS 1600                                                          00005230
            C                                                                         00005240
ISN 0357     6002 IF(NPH.EQ.0) GO TO 6003                                             00005250
ISN 0359          DO 5550 J=1,NPH                                                     00005260
ISN 0360          READ 5551,IPHDP(J),T1,T2,T3                                         00005270
ISN 0361          I=IPHDP(J)                                                          00005280
ISN 0362          PHIDP(I)=T1                                                         00005290
ISN 0363          THEDP(I)=T2                                                         00005300
ISN 0364          PSIDP(I)=T3                                                         00005310
ISN 0365     5551 FORMAT(I5,5X,3E10.0)                                                00005320
ISN 0366     5550 CONTINUE                                                            00005330
            C                                                                         00005340
            C     CARDS 1700                                                          00005350
            C                                                                         00005360
ISN 0367     6003 IF(NACC.EQ.0) GO TO 6005                                            00005370
ISN 0369          IF(NACC.GT.50) GO TO 7003                                           00005380
ISN 0371          KOUNT = 0                                                           00005390
ISN 0372          DO 7010 I=1,NACC                                                    00005400
ISN 0373          READ 7000,MASSNO(I),DIR(I),NPTS(I)                                  00005410
ISN 0374     7000 FORMAT(3I5)                                                         00005420
ISN 0375          JAY(I,1) = I                                                        00005430
ISN 0376          JAY(I,2) = NPTS(I)                                                  00005440
ISN 0377          KOUNT = KOUNT+NPTS(I)                                               00005450
ISN 0378          IF(KOUNT.GT.300) GO TO 7003                                         00005460
ISN 0380     7010 CONTINUE                                                            00005470
            C                                                                         00005480
            C     CARDS 1800                                                          00005490
            C                                                                         00005500
ISN 0381          L=0                                                                 00005510
ISN 0382          DO 7002 I=1,NACC                                                    00005520
ISN 0383          K=NPTS(I)                                                           00005530
ISN 0384          DO 7002 J=1,K                                                       00005540
ISN 0385          L=L+1                                                               00005550
ISN 0386          READ 7004,TIM(L),ACCEL(L)                                           00005560
ISN 0387     7004 FORMAT(2E10.0)                                                      00005570
ISN 0388     7002 CONTINUE                                                            00005580
ISN 0389          GO TO 6005                                                          00005590
ISN 0390     7003 PRINT 7005,NACC,KOUNT                                               00005600
ISN 0391     7005 FORMAT(1X,'7. ERROR IN ACCEL TIME DATA INPUT' / 1X,                 00005610
                 *     'NUMACL,KOUNT = ',2I5)                                         00005620
            C                                                                         00005630
            C     CARDS 2000                                                          00005640
            C                                                                         00005650
ISN 0392     6005 IF(NKM.EQ.0) GO TO 5000                                             00005660
ISN 0394          DO 5521 I1=1,NKM                                                    00005670
ISN 0395          READ 5520,M,I,N,J                                                   00005680
ISN 0396     5520 FORMAT(2(I2,I3))                                                    00005690
ISN 0397          DO 5523 I2=1,NB                                                     00005700
```

```
ISN 0398         IF(I.EQ.IG(I2).AND.J.EQ.JG(I2).AND.M.EQ.MG(I2).AND.N.EQ.NG(I2))     00005710
                1 IJ=I2                                                              00005720
ISN 0400    5523 CONTINUE                                                            00005730
ISN 0401         NKMVEC(IJ) = 1                                                      00005740
ISN 0402         READ 5300,((XK3(L,K,IJ),L=1,6),K=1,6)                               00005750
ISN 0403    5521 CONTINUE                                                            00005760
ISN 0404    5000 CONTINUE                                                            00005770
            C                                                                        00005780
            C    NPLT=NO. OF PLOTS EACH TIME(MAX. OF 10)                             00005790
            C    ITPL =DESCRIBES PLANE 1=XY,2=XZ,3=YZ                                00005800
            C    NMPTS=NO. OF POINTS FOR A PLOT CURRENTLY=NO.MASS POINTS             00005810
            C    MNUM=MASS NUMBERS TO BE PLOTTED                                     00005820
            C                                                                        00005830
ISN 0405         IF(NPLT .EQ. 0) GO TO 100                                           00005840
ISN 0407         DO 200 IP=1,NPLT                                                    00005850
ISN 0408         READ 5400, ITPL(IP),NMPTS(IP),ISCALE(IP),XSCALE(IP),YSCALE(IP)      00005860
ISN 0409         NPT = NMPTS(IP)                                                     00005870
ISN 0410         READ 5410, (MNUM(JP,IP), JP=1, NPT)                                 00005880
ISN 0411    5400 FORMAT(3I5,5X,2E10.5)                                               00005890
ISN 0412    5410 FORMAT(14I5)                                                        00005900
ISN 0413     200 CONTINUE                                                            00005910
ISN 0414     100 CONTINUE                                                            00005920
ISN 0415         IF(NMEP .EQ. 0) GO TO 8000                                          00005930
ISN 0417         DO 8010 I=1, NMEP                                                   00005940
ISN 0418         READ 5200, (JMASS(I,J), J=1, 10)                                    00005950
ISN 0419    8010 CONTINUE                                                            00005960
ISN 0420    8000 IF(NNEP .EQ. 0) GO TO 8020                                          00005970
ISN 0422         DO 8030 I=1, NNEP                                                   00005980
ISN 0423         READ 5200, (JNODE(I,J), J=1, 8)                                     00005990
ISN 0424    8030 CONTINUE                                                            00006000
ISN 0425    8020 IF(NBFP .EQ. 0) GO TO 8040                                          00006010
ISN 0427         DO 8050 I=1, NBFP                                                   00006020
ISN 0428         READ 5200, (JBMF(I,J), J=1, 4)                                      00006030
ISN 0429    8050 CONTINUE                                                            00006040
ISN 0430    8040 IF(NBDP .EQ. 0) GO TO 8060                                          00006050
ISN 0432         DO 8070 I=1, NBDP                                                   00006060
ISN 0433         READ 5200, (JBMD(I,J), J=1, 4)                                      00006070
ISN 0434    8070 CONTINUE                                                            00006080
ISN 0435    8060 IF(NSTP .EQ. 0) GO TO 8080                                          00006090
ISN 0437         DO 8090 I=1, NSTP                                                   00006100
ISN 0438         READ 5200, (JBMS(I,J), J=1, 6)                                      00006110
ISN 0439    8090 CONTINUE                                                            00006120
ISN 0440    8080 IF(NSEP .EQ. 0) GO TO 8100                                          00006130
ISN 0442         DO 8110 I=1, NSEP                                                   00006140
ISN 0443         READ 5200, (JSPR(I,J), J=1, 4)                                      00006150
ISN 0444    8110 CONTINUE                                                            00006160
ISN 0445    8100 IF(NENP.EQ.0) GO TO 8101                                            00006170
ISN 0447         DO 8102 I=1,NENP                                                    00006180
ISN 0448         READ 5200,(JENG(I,J),J=1,3)                                         00006190
ISN 0449    8102 CONTINUE                                                            00006200
ISN 0450    8101 IF(NDRP .EQ. 0) GO TO 8120                                          00006210
ISN 0452         DO 8130 I=1, NDRP                                                   00006220
ISN 0453         READ 5200, JDRI(I)                                                  00006230
```

```
ISN 0454      8130 CONTINUE                                    00006240
ISN 0455      8120 RETURN                                      00006250
ISN 0456           END                                         00006260
```

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LEVEL 21.8 ( JUN 74 )                    OS/360  FORTRAN H                         DATE  79.177/14.31.14

    ************************************************************************************************
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       COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                          SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
           C            DATA SET D2334ITERP AT LEVEL 003 AS OF 06/25/79
  ISN 0002            SUBROUTINE INTERP(IREF,TT,YOUT)                                    00000010
  ISN 0003            IMPLICIT REAL*8 (A-H,O-Z)                                          00000020
  ISN 0004            COMMON/INAC/ACCEL(300),TIM(300),INDEX(50,2),JAY(50,2)              00000030
  ISN 0005            XNUM=ACCEL(IREF+1)-ACCEL(IREF)                                     00000040
  ISN 0006            XDEN=TIM(IREF+1)-TIM(IREF)                                         00000050
  ISN 0007            SLOPE=XNUM/XDEN                                                    00000060
  ISN 0008            YOUT=ACCEL(IREF)+SLOPE*(TT-TIM(IREF))                              00000070
  ISN 0009       6400 FORMAT(5E15.6)                                                     00000080
  ISN 0010            RETURN                                                             00000090
  ISN 0011            END                                                                00000100
```

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**************************************************************************************
*                                                                                    *
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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C            DATA SET D2334MAMUL AT LEVEL 001 AS OF 03/24/76
  ISN 0002         SUBROUTINE MATMUL(A,B,C)                                  00000010
  ISN 0003         IMPLICIT REAL*8 (A-H,O-Z)                                 00000020
  ISN 0004         DIMENSION A(3,3),B(3,3),C(3,3)                            00000030
            C A*B TO C                                                       00000040
  ISN 0005         DO 10 I = 1,3                                             00000050
  ISN 0006         DO 10 J = 1,3                                             00000060
  ISN 0007         SUM = 0.0                                                 00000070
  ISN 0008         DO 20 K = 1,3                                             00000080
  ISN 0009      20 SUM = SUM+A(I,K)*B(K,J)                                   00000090
  ISN 0010      10 C(I,J) = SUM                                              00000100
  ISN 0011         RETURN                                                    00000110
  ISN 0012         END                                                       00000120
```

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   COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                      SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
         C              DATA SET D2334MAVEC AT LEVEL 001 AS OF 03/24/76
ISN 0002          SUBROUTINE MATVEC(A,V,P,ISW)                           00000010
ISN 0003          IMPLICIT REAL*8 (A-H,O-Z)                              00000020
ISN 0004          DIMENSION A(3,3),V(3),P(3)                             00000030
            C A*V TO P IF ISW = 0, ELSE AT*V TO P                        00000040
ISN 0005          DO 10 I = 1,3                                          00000050
ISN 0006          SUM = 0.0                                              00000060
ISN 0007          DO 20 K = 1,3                                          00000070
ISN 0008          IF(ISW) 40,30,40                                       00000080
ISN 0009       30 SUM = SUM+A(I,K)*V(K)                                  00000090
ISN 0010          GO TO 20                                               00000100
ISN 0011       40 SUM = SUM+A(K,I)*V(K)                                  00000110
ISN 0012       20 CONTINUE                                               00000120
ISN 0013       10 P(I) = SUM                                             00000130
ISN 0014          RETURN                                                 00000140
ISN 0015          END                                                    00000150
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          COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                             SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                  C        DATA SET D2334PAPLO AT LEVEL 005 AS OF 07/19/78
ISN 0002                SUBROUTINE PAPLOT(V,W,XSCALE,YSCALE,MASS,NMPTS,ISCALE)        00000010
ISN 0003                IMPLICIT REAL*8(A-H,O-Z)                                      00000020
                  C                                                                   00000030
ISN 0004                INTEGER*4 S,G                                                 00000040
ISN 0005                INTEGER*2 NMPTS,MASS,ISCALE                                   00000050
                  C                                                                   00000060
                  C     SUBROUTINE TO GENERATE ONLINE PAPER PLOTS                     00000070
                  C                                                                   00000080
ISN 0006                DIMENSION V(1),W(1),S(105),BX(500),G(9),X(101),Y(101),NN(10), 00000090
                       *          MASS(1),XAXIS(11),YAXIS(9),M(101),MN(101,2)         00000100
ISN 0007                DATA S(1),S(105)/'(4X,',')' '/                                00000110
ISN 0008                DATA G/'1X,','1H*','1H.','1H-','1H+','INCH','E9.3',',','9X'/  00000120
ISN 0009                DATA NN/'1H1','1H2','1H3','1H4','1H5','1H6','1H7','1H8','1H9', 00000130
                       *      '1H0'/                                                  00000140
                  C                                                                   00000150
ISN 0010                IAXIS = 10                                                    00000160
                  C                                                                   00000170
                  C     SET UP SCALE VALUES FOR INDEPENDANT 'X' ARRAY                 00000180
                  C                                                                   00000190
ISN 0011                XMAX = -1.0E10                                                00000200
ISN 0012                YMAX = -1.0E10                                                00000210
ISN 0013                XMIN = 1.0E10                                                 00000220
ISN 0014                YMIN = 1.0E10                                                 00000230
ISN 0015                DO 10 I=1, NMPTS                                              00000240
ISN 0016                XMAX = DMAX1(V(I),XMAX)                                       00000250
ISN 0017                XMIN = DMIN1(V(I),XMIN)                                       00000260
ISN 0018                YMAX = DMAX1(W(I),YMAX)                                       00000270
ISN 0019                YMIN = DMIN1(W(I),YMIN)                                       00000280
ISN 0020                X(I) = V(I)                                                   00000290
ISN 0021                Y(I) = W(I)                                                   00000300
ISN 0022                M(I) = MASS(I)                                                00000310
ISN 0023             10 CONTINUE                                                      00000320
ISN 0024                IF(ISCALE .EQ. 3) GO TO 50                                    00000330
ISN 0026                DX = XMAX - XMIN                                              00000340
ISN 0027                DY = YMAX - YMIN                                              00000350
                  C                                                                   00000360
                  C     IF ISCALE=1 SELECT SCALES INDEPENDENTLY BASED ON X AND Y      00000370
                  C     IF ISCALE=0 SELECT SCALES OF EQUAL MAGNITUDE                  00000380
                  C                                                                   00000390
ISN 0028                IF(ISCALE .EQ. 1) GO TO 118                                   00000400
```

```
ISN 0030          IF(DY .GT. DX) DX = DY
ISN 0032          IF(DX .GT. DY) DY = DX
ISN 0034      118 CONTINUE
ISN 0035          DX = DX / 10.0
ISN 0036          DY = DY / 8.0
            C
ISN 0037          IAX = YMIN / DY
ISN 0038          YAXIS(1) = IAX * DY
ISN 0039          IF(YAXIS(1) .LT. 0.0) YAXIS(1) = YAXIS(1) - DY
ISN 0041          IAX = (YMAX / DY) + 1
ISN 0042          YSCALE = ((IAX * DY) - YAXIS(1)) / 8.0
ISN 0043          IAX = XMIN / DX
ISN 0044          XAXIS(1) = IAX * DX
ISN 0045          IF(XAXIS(1) .LT. 0.0) XAXIS(1) = XAXIS(1) - DX
ISN 0047          IAX = (XMAX / DX) + 1
ISN 0048          XSCALE = ((IAX * DX) - XAXIS(1)) / 10.0
ISN 0049          GO TO 60
ISN 0050       50 CONTINUE
ISN 0051          IAX = YMIN / YSCALE
ISN 0052          YAXIS(1) = IAX * YSCALE
ISN 0053          IF(YAXIS(1) .LT. 0.0) YAXIS(1) = YAXIS(1) - YSCALE
ISN 0055          IAX = XMIN / XSCALE
ISN 0056          XAXIS(1) = IAX * XSCALE
ISN 0057          IF(XAXIS(1) .LT. 0.0) XAXIS(1) = XAXIS(1) - XSCALE
ISN 0059       60 CONTINUE
ISN 0060          DO 90 I=2, 9
ISN 0061          YAXIS(I) = YAXIS(1) + (I - 1) * YSCALE
ISN 0062       90 CONTINUE
ISN 0063          DO 120 I=2, 11
ISN 0064          XAXIS(I) = XAXIS(1) + (I - 1) * XSCALE
ISN 0065      120 CONTINUE
ISN 0066          IF(YMAX .GT. YAXIS(9) .OR. XMAX .GT. XAXIS(11)) WRITE(6,7040)
ISN 0068     7040 FORMAT(2X,'***   WARNING   ***   ONE OR MORE MASS POINTS ARE NOT',
                *      ' INCLUDED IN THE FOLLOWING PLOT BECAUSE THE COORDINATES',
                *      ' OF THE POINT(S) ARE' / 24X, 'OUTSIDE THE LIMITS OF THE',
                *      ' PLOT.')
ISN 0069          X1 = XAXIS(1)
ISN 0070          DX = XAXIS(11) - XAXIS(1)
ISN 0071          DY = YAXIS(9) - YAXIS(1)
            C
            C     REORDER DEPENDENT 'Y' ARRAY IN MONOTONICALLY INCREASING MAGNITUDE
            C
ISN 0072          CALL FSHELL(Y,BX,NMPTS)
            C
            C     REORDER INDEPENDENT 'X' ARRAY IN CORRESPONDENCE WITH PRESENT 'Y'
            C     ARRAY
            C
ISN 0073          CALL SHELLX(X,BX,NMPTS)
            C
ISN 0074          CALL SHELLM(BX,M,NMPTS)
            C
            C     LINE LOCATES HORIZONTAL AXIS
            C
```

```
ISN 0075          YFIRST = YAXIS(1)                                          00000940
ISN 0076          YLAST = YAXIS(9)                                           00000950
            C                                                                00000960
ISN 0077          IF(YLAST .LE. 0.0) WRITE(6,7030)(XAXIS(I), I=1, 11)        00000970
            C                                                                00000980
            C     LOCATE FIRST VERTICAL SCALE MARK                           00000990
            C     MARK LOCATES '-' IN VERTICAL SCALE                         00001000
            C                                                                00001010
ISN 0079          MARK = 0                                                   00001020
ISN 0080          LO = (-YFIRST * 48.0 / DY) + 1.5                           00001030
ISN 0081          IF(LO .GT. 49) LO = 49                                     00001040
ISN 0083          J = 1                                                      00001050
ISN 0084          N = 1                                                      00001060
ISN 0085          NL = 50                                                    00001070
            C                                                                00001080
            C     START LINE LOOP                                            00001090
            C                                                                00001100
ISN 0086      100 CONTINUE                                                   00001110
            C                                                                00001120
            C     IDENTIFY CURRENT PRINT LINE NUMBER                         00001130
            C                                                                00001140
ISN 0087          NL = 50 - N                                                00001150
            C                                                                00001160
            C     SET UP I1 AND I2 FOR NORMAL PRINT LINE                     00001170
            C                                                                00001180
ISN 0088          I1 = 1                                                     00001190
ISN 0089          I2 = 3                                                     00001200
ISN 0090          IF(NL .EQ. 1 .AND. YLAST .GT. 0.0) GO TO 110               00001210
ISN 0092          IF(NL .NE. LO) GO TO 125                                   00001220
            C                                                                00001230
            C     SET UP I1 AND I2 FOR ZERO AXIS PRINT LINE                  00001240
            C                                                                00001250
ISN 0094      110 CONTINUE                                                   00001260
ISN 0095          I1 = 4                                                     00001270
ISN 0096          I2 = 5                                                     00001280
ISN 0097      125 CONTINUE                                                   00001290
ISN 0098          DO 150 I=5, 104                                            00001300
ISN 0099          S(I) = G(I1)                                               00001310
ISN 0100      150 CONTINUE                                                   00001320
ISN 0101          S(2) = G(9)                                                00001330
ISN 0102          S(3) = G(8)                                                00001340
ISN 0103          S(4) = G(I2)                                               00001350
            C                                                                00001360
            C     PUT HORIZONTAL SCALE MARKS IN 'S' ARRAY                    00001370
            C                                                                00001380
ISN 0104          IF(NL .EQ. 1 .AND. YLAST .GT. 0.0) GO TO 115               00001390
ISN 0106          IF(NL .NE. LO) GO TO 160                                   00001400
ISN 0108      115 CONTINUE                                                   00001410
ISN 0109          DO 155 I1=14, 104, 10                                      00001420
ISN 0110      155 S(I1) = G(5)                                               00001430
ISN 0111      160 CONTINUE                                                   00001440
            C                                                                00001450
            C     START DIMINISHING LOOP ON DEPENDENT ARRAY LINE I.D.        00001460
```

```
             C
ISN 0112           KT = 0
ISN 0113           DO 250 I2=J, NMPTS
ISN 0114           JJ = I2
ISN 0115           K = NMPTS - I2 + 1
ISN 0116           IF(Y(K) .GT. YAXIS(9)) GO TO 250
ISN 0118           L = ((Y(K) - YFIRST) * 48.0 / DY) + 1.5
ISN 0119           IF(L - NL) 260,200,250
ISN 0120       200 CONTINUE
             C
             C     CALCULATE LOCATION IN 'S' ARRAY FOR DATA POINT I.D.
             C
ISN 0121           I1 = ((X(K) - X1) * 100.0 / DX) + 4.5
ISN 0122           IF(X(K) .GT. XAXIS(11)) GO TO 250
ISN 0124           S(I1) = G(2)
ISN 0125           KT = KT + 1
ISN 0126           MN(KT,1) = I1
ISN 0127           MN(KT,2) = K
ISN 0128       250 CONTINUE
ISN 0129           J = NMPTS
ISN 0130           GO TO 275
ISN 0131       260 J = JJ
ISN 0132       275 N = N + 1
             C
ISN 0133           IF(KT .EQ. 0) GO TO 190
ISN 0135           DO 140 I=4, 104
ISN 0136           IF(S(I) .NE. G(2)) GO TO 140
ISN 0138           DO 170 II=1, KT
ISN 0139           I1 = MN(II,1)
ISN 0140           K = MN(II,2)
ISN 0141           IF(I .EQ. I1) GO TO 180
ISN 0143       170 CONTINUE
ISN 0144           GO TO 140
ISN 0145       180 CONTINUE
ISN 0146           IF(M(K) .LT. 10) GO TO 20
ISN 0148           IX = M(K) / 10
ISN 0149           IY = M(K) - (IX * 10)
ISN 0150           IF(IY .EQ. 0) IY = 10
ISN 0152           IF(I1 .GE. 103) GO TO 30
ISN 0154           IF(S(I1+1) .EQ. G(2) .OR. S(I1+2) .EQ. G(2)) GO TO 30
ISN 0156           S(I1+1) = NN(IX)
ISN 0157           S(I1+2) = NN(IY)
ISN 0158           GO TO 140
ISN 0159        30 IF(I1 .LE. 5) GO TO 140
ISN 0161           IF(S(I1-1) .EQ. G(2) .OR. S(I1-2) .EQ. G(2)) GO TO 140
ISN 0163           S(I1-1) = NN(IY)
ISN 0164           S(I1-2) = NN(IX)
ISN 0165           GO TO 140
ISN 0166        20 IF(I1 .GE. 104) GO TO 40
ISN 0168           IF(S(I1+1) .EQ. G(2)) GO TO 40
ISN 0170           S(I1+1) = NN(M(K))
ISN 0171           GO TO 140
ISN 0172        40 IF(I1 .LE. 4) GO TO 140
```

```
ISN 0174          IF(S(I1-1) .EQ. G(2)) GO TO 140
ISN 0176          S(I1-1) = NN(M(K))
ISN 0177      140 CONTINUE
ISN 0178      190 CONTINUE
            C
            C     TEST FOR SCALE MARK LOCATION
            C
ISN 0179          IF(MARK .NE. 0) GO TO 350
            C
            C     PLACE VERTICAL SCALE MARK IN 'S' ARRAY
            C
ISN 0181          IF(S(4) .NE. G(2)) S(4) = G(5)
ISN 0183          S(2) = G(7)
            C
ISN 0184          IAXIS = IAXIS - 1
ISN 0185          WRITE(6,S) YAXIS(IAXIS)
            C
            C     RESET MARK INDEX
            C
ISN 0186          MARK = 6
ISN 0187          GO TO 340
ISN 0188      350 CONTINUE
            C
            C     GENERATE ONE LINE OF PLOTTING
            C
ISN 0189          WRITE(6,S)
            C
            C     DECREMENT MARK INDEX
            C
ISN 0190      340 MARK = MARK - 1
            C
            C     TEST FOR LAST LINE TO DETERMINE IF PLOT IS COMPLETED
            C
ISN 0191          IF(NL .GT. 1) GO TO 100
            C
            C     END OF PLOT.  PRINT MAXIMUMS, MINIMUMS, AND SCALES
            C
ISN 0193          IF(YLAST .LE. 0.0) GO TO 130
ISN 0195          PRINT 7030, (XAXIS(I), I=1, 11)
ISN 0196      130 CONTINUE
ISN 0197          RETURN
            C
            C     FORMATS
            C
ISN 0198     7000 FORMAT(1X)
ISN 0199     7030 FORMAT(8X,11(1X,E9.3))
ISN 0200          END
```

```
     ******************************************************************************
     *                                                                            *
     *                                                                            *
     *                                                                            *
     *                                                                            *
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     *                                                                            *
     ******************************************************************************

       COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                          SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C       DATA SET D2334PLOTT AT LEVEL 001 AS OF 09/14/77
  ISN 0002           SUBROUTINE PLOTT(M,NP,X,Y1,Y2,Y3)                                00000010
               C                                                                      00000020
               C     *-*-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*00000030
               C                  PLOTT PLOTS UP TO 3 DEPENDENT,CONTINOUS,            00000040
               C                  SINGLED VALUED FUNCTIONS (Y1,Y2,Y3) AGAINST         00000050
               C                  AN EVEN INCREMENTED INDEPENDENT VARIABLE(X).        00000060
               C                  M IS THE NUMBER OF DEPENDENT VARIABLES              00000070
               C                  NP IS THE DIMENSION OF THE ARRAYS X,Y1,Y2,Y3        00000080
               C     *-*-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*00000090
               C                                                                      00000100
  ISN 0003           DIMENSION X(1),Y1(1),Y2(1),Y3(1),A(100),PP(3),PM(3),PLOT(105)    00000110
  ISN 0004           DATA BLNK,PRD,STAR,EQ,PLUS/1H ,1H.,1H*,1H=,1H+/                  00000120
  ISN 0005       900 FORMAT(F7.3,1PE13.3,1P2E10.3,5X,85A1)                            00000130
  ISN 0006       901 FORMAT(F7.3,1PE13.3,1PE10.3,5X,95A1)                             00000140
  ISN 0007       902 FORMAT(F7.3,1PE13.3,5X,105A1)                                    00000150
  ISN 0008       910 FORMAT(14X,1H*,9X,1H=,9X,1H+,74X,14HSCALE FACTOR =,1PE10.3)      00000160
  ISN 0009       911 FORMAT(14X,1H*,9X,1H=,84X,14HSCALE FACTOR =,1PE10.3)             00000170
  ISN 0010       912 FORMAT(14X,1H*,94X,14HSCALE FACTOR =,1PE10.3)                    00000180
  ISN 0011       920 FORMAT(1X,120(1H.),11HI.........I)                               00000190
  ISN 0012           DO 5 I=1,105                                                     00000200
  ISN 0013         5 PLOT(I)=BLNK                                                     00000210
  ISN 0014           DO 6 I=1,3                                                       00000220
  ISN 0015           PP(I)=0.0                                                        00000230
  ISN 0016         6 PM(I)=0.0                                                        00000240
               C                                                                      00000250
               C     *-*-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*00000260
               C                  MAX. AND MIN.VALUES OF DEPENDENT VARIABLES          00000270
               C                         ARE OBTAINED                                 00000280
               C     *-*-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*00000290
               C                                                                      00000300
  ISN 0017           DO 10 I=1,NP                                                     00000310
  ISN 0018        10 A(I)=Y1(I)                                                       00000320
  ISN 0019           MSW=1                                                            00000330
  ISN 0020           GO TO 60                                                         00000340
  ISN 0021        20 DO 30 I=1,NP                                                     00000350
  ISN 0022        30 A(I)=Y3(I)                                                       00000360
  ISN 0023           MSW=2                                                            00000370
  ISN 0024           GO TO 60                                                         00000380
  ISN 0025        40 DO 50 I=1,NP                                                     00000390
  ISN 0026        50 A(I)=Y2(I)                                                       00000400
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ISN 0027          MSW=3                                                     00000410
ISN 0028       60 DO 90 I=1,NP                                              00000420
ISN 0029          IF(A(I)-PP(MSW)) 70,75,75                                 00000430
ISN 0030       70 IF(A(I)-PM(MSW)) 80,90,90                                 00000440
ISN 0031       80 PM(MSW)=A(I)                                              00000450
ISN 0032          GO TO 90                                                  00000460
ISN 0033       75 PP(MSW)=A(I)                                              00000470
ISN 0034       90 CONTINUE                                                  00000480
            C                                                               00000490
            C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-00000500
            C                REFERENCE AND SCALE FACTOR ARE CALCULATED      00000510
            C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-00000520
            C                                                               00000530
ISN 0035          IF(MSW-(M-1))20,40,92                                     00000540
ISN 0036       92 CONTINUE                                                  00000550
ISN 0037          XM=0.0                                                    00000560
ISN 0038          XMI=PP(1)                                                 00000570
ISN 0039          DO 96 I=1,3                                               00000580
ISN 0040          IF(PP(I)-XM) 93,94,94                                     00000590
ISN 0041       94 XM=PP(I)                                                  00000600
ISN 0042       93 IF(PM(I)-XMI) 95,95,96                                    00000610
ISN 0043       95 XMI=PM(I)                                                 00000620
ISN 0044       96 CONTINUE                                                  00000630
ISN 0045          A(2)=PP(2)                                                00000640
ISN 0046          A(3)=PM(2)                                                00000650
ISN 0047          PP(2)=PP(3)                                               00000660
ISN 0048          PM(2)=PM(3)                                               00000670
ISN 0049          PP(3)=A(2)                                                00000680
ISN 0050          PM(3)=A(3)                                                00000690
ISN 0051          NRA=104-(M-1)*10                                          00000700
ISN 0052          RA=NRA                                                    00000710
ISN 0053          SF=(XM-XMI)/RA                                            00000720
ISN 0054          SFT=10.*SF                                                00000730
ISN 0055          IF(SF .EQ. 0.0) SF=1.0                                    00000735
ISN 0057          IF(ABS(XM-XMI).LT.1.E-6)GO TO 97                          00000740
ISN 0059          REF= ABS(XMI/(XM-XMI))*RA+1.5                             00000750
ISN 0060          GO TO 98                                                  00000760
ISN 0061       97 REF=1.5                                                   00000770
ISN 0062       98 NR=REF                                                    00000780
ISN 0063          IF(M-2)100,105,110                                        00000790
ISN 0064      100 PRINT 912, SFT                                            00000800
ISN 0065          GO TO 120                                                 00000810
ISN 0066      105 PRINT 911, SFT                                            00000820
ISN 0067          GO TO 120                                                 00000830
ISN 0068      110 PRINT 910, SFT                                            00000840
ISN 0069      120 PRINT 920                                                 00000850
ISN 0070          DO 200 I=1,NP                                             00000860
ISN 0071          PLOT(NR)=PRD                                              00000870
ISN 0072          L=Y1(I)/SF+REF                                            00000880
ISN 0073          PLOT(L)=STAR                                              00000890
ISN 0074          IF(M.EQ.1)GO TO 130                                       00000900
ISN 0076          K=Y2(I)/SF+REF                                            00000910
ISN 0077          PLOT(K)=EQ                                                00000920
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ISN 0078          IF(M.EQ.2)GO TO 140
ISN 0080          J=Y3(I)/SF+REF
ISN 0081          PLOT(J)=PLUS
ISN 0082          GO TO 150
ISN 0083      130 PRINT 902, X(I),Y1(I),(PLOT(J),J=1,105)
ISN 0084          PLOT(L)=BLNK
ISN 0085          GO TO 200
ISN 0086      140 PRINT 901, X(I),Y1(I),Y2(I),(PLOT(J),J=1,95)
ISN 0087          PLOT(L)=BLNK
ISN 0088          PLOT(K)=BLNK
ISN 0089          GO TO 200
ISN 0090      150 PRINT 900, X(I),Y1(I),Y2(I),Y3(I),(PLOT(J),J=1,85)
            C
            C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
            C                  PLOT FIELD IS RE-ZEROED
            C     *-*-*-*-*-*---*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-
            C
ISN 0091          DO 160 NO=1,105
ISN 0092      160 PLOT(NO)=BLNK
ISN 0093      200 CONTINUE
ISN 0094          RETURN
ISN 0095          END
```

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      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
              C          DATA SET D2334PREPL AT LEVEL 004 AS OF 06/25/79
              C          DATA SET D2332VPP   AT LEVEL 001 AS OF 01/17/78
              C          DATA SET D2332VPREP AT LEVEL 006 AS OF 10/07/77
ISN 0002            SUBROUTINE PREPLT(TPRINT,NM,NNP,NB,NSP,NDRI,MSECIN)
              C
              C     IN SUBROUTINE PREPLT, OUTPUT DATA FROM KRASH ARE SHUFFLED AND
              C     PROCESSED FOR SUBSEQUENT USE IN SUBROUTINE PLOTT.
              C
ISN 0003            INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                   *         JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),
                   *         JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),
                   *         NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
ISN 0004            REAL*8 TPRINT,TMAX
              C
ISN 0005            DIMENSION WORK(900)
ISN 0006            DIMENSION AM(31,27),TM(31),IM(31)
ISN 0007            DIMENSION AN(41,18),TN(41),IN(41),INM(41)
ISN 0008            DIMENSION AB(51,8),TB(51),IBG(51),JBG(51),MBG(51),
                   *         NBG(51),IB(51)
ISN 0009            DIMENSION AT(51,10),TT(51),ITG(51),JTG(51),MTG(51),
                   *         NTG(51),IT(51)
ISN 0010            DIMENSION AS(41,6),TS(41),ISM(41),ISN(41)
ISN 0011            DIMENSION AE(51,4),TE(51),IEG(51),JEG(51),MEG(51),NEG(51),IE(51)
ISN 0012            DIMENSION AD(101),TD(101),IDM(101)
ISN 0013            DIMENSION AV(201,3),TV(201)
              C
ISN 0014            COMMON/MACFIN/ TMAX,IPRINT
ISN 0015            COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,
                   *              JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,
                   *              NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT
              C
ISN 0016            EQUIVALENCE (WORK(1),AM(1,1)),(WORK(838),TM(1)),
                   *            (WORK(869),IM(1))
ISN 0017            EQUIVALENCE (WORK(1),AN(1,1)),(WORK(738),TN(1)),
                   *            (WORK(779),IN(1)),(WORK(820),INM(1))
ISN 0018            EQUIVALENCE (WORK(1),AB(1,1)),(WORK(409),TB(1)),
                   *            (WORK(460),IBG(1)),(WORK(511),JBG(1)),
                   *            (WORK(562),MBG(1)),(WORK(613),NBG(1)),
                   *            (WORK(664),IB(1))
ISN 0019            EQUIVALENCE (WORK(1),AT(1,1)),(WORK(511),TT(1)),
                   *            (WORK(562),ITG(1)),(WORK(613),JTG(1)),
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                  *           (WORK(664),MTG(1)),(WORK(715),NTG(1)),
                  *           (WORK(766),IT(1))
ISN 0020            EQUIVALENCE (WORK(1),AS(1,1)),(WORK(247),TS(1)),
                  *           (WORK(288),ISM(1)),(WORK(329),ISN(1))
ISN 0021            EQUIVALENCE (WORK(1),AE(1,1)),(WORK(205),TE(1)),
                  *           (WORK(256),IEG(1)),(WORK(307),JEG(1)),
                  *           (WORK(358),MEG(1)),(WORK(409),NEG(1)),
                  *           (WORK(460),IE(1))
ISN 0022            EQUIVALENCE (WORK(1),AD(1)),(WORK(102),TD(1)),
                  *           (WORK(203),IDM(1))
ISN 0023            EQUIVALENCE (WORK(1),AV(1,1)),(WORK(604),TV(1))
              C
ISN 0024            TREST = MSECIN * 0.001
ISN 0025            NDT = ((TMAX - TREST) /  TPRINT ) + 1.00001
              C
              C     PLOT MASS POINT DATA IF REQUESTED
              C
ISN 0026            REWIND 12
ISN 0027            IF(NMEP .LE. 0) GO TO 70
ISN 0029            PRINT 7000, NMEP
ISN 0030       7000 FORMAT (1H1,5X,I5,2X,'MASS PLOT FLAG SUMMARY')
ISN 0031            DO 7010 I=1, NMEP
ISN 0032            PRINT 7020, (JMASS(I,J), J=1, 10)
ISN 0033       7020 FORMAT (10X,10I8)
ISN 0034       7010 CONTINUE
ISN 0035            REWIND 1
ISN 0036            L = 1
ISN 0037            ICNT = 0
ISN 0038            NCNT = 0
ISN 0039            DO 10 I=1, NMEP
ISN 0040            IFIND = 0
ISN 0041            IF(NMEW .EQ. 0) GO TO 15
ISN 0043            DO 20 J=1, NDT
ISN 0044            DO 30 K=1, NMEW
ISN 0045            READ(1) (TM(L),DUMMY,IM(L),(AM(L,M),DUMMY, M=1, 27))
ISN 0046            IF(IM(L) .NE. JMASS(I,1)) GO TO 30
ISN 0048            IFIND = 1
ISN 0049            L = L + 1
ISN 0050            ICNT = ICNT + 1
ISN 0051         30 CONTINUE
ISN 0052         20 CONTINUE
ISN 0053            IF(IFIND .EQ. 1) GO TO 35
ISN 0055         15 PRINT 6023, JMASS(I,1)
ISN 0056       6023 FORMAT(1H1,5X,'18. UNABLE TO FIND DATA FOR MASS',I5,
                  *         '.  PLOTS FOR THIS MASS WILL BE SUPPRESSED.')
ISN 0057         35 IF((ICNT+NDT).LE.30) GO TO 50
ISN 0059            NCNT = 1
ISN 0060            DO 40 K=1, ICNT
ISN 0061            WRITE(12) (TM(K),IM(K),(AM(K,M), M=1, 27))
ISN 0062         40 CONTINUE
ISN 0063            ICNT = 0
ISN 0064            L = 1
ISN 0065         50 CONTINUE
```

```
ISN 0066          REWIND 1
ISN 0067       10 CONTINUE
ISN 0068          IF(ICNT.EQ.30.OR.NCNT.EQ.0) GO TO 65
ISN 0070          DO 60 K=1, ICNT
ISN 0071          WRITE(12) (TM(K),IM(K),(AM(K,M), M=1, 27))
ISN 0072       60 CONTINUE
ISN 0073       65 CONTINUE
ISN 0074          IF(NCNT .NE. 0) REWIND 12
ISN 0076          IFIND = 0
ISN 0077          IC = 0
ISN 0078          DO 85 I=1, NMEP
ISN 0079          IF(IFIND .EQ. 1) GO TO 2010
ISN 0081          IC = IC + 1
ISN 0082          IF(NCNT .EQ. 0) GO TO 2000
ISN 0084          IF(IC .GT. NMEW) GO TO 81
ISN 0086          ICNT = 1
ISN 0087          DO 90 J=1, NDT
ISN 0088          READ(12) (TM(J),IM(J),(AM(J,K), K=1, 27))
ISN 0089       90 CONTINUE
ISN 0090          GO TO 2010
ISN 0091     2000 ICNT = IC * NDT + 1 - NDT
ISN 0092     2010 CONTINUE
ISN 0093          IF(IM(ICNT) .EQ. JMASS(I,1)) GO TO 45
ISN 0095          IFIND = 1
ISN 0096          GO TO 80
ISN 0097       45 IFIND = 0
ISN 0098          IF(JMASS(I,2) .EQ. 0) GO TO 100
ISN 0100          PRINT 6000, IM(ICNT)
ISN 0101     6000 FORMAT(1H1,5X,'MASS ',I3,3X,'DISPLACEMENTS(IN)' //
                 *        1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')
ISN 0102          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,1),AM(ICNT,2),AM(ICNT,3))
ISN 0103      100 CONTINUE
ISN 0104          IF(JMASS(I,3) .EQ. 0) GO TO 110
ISN 0106          PRINT 6001, IM(ICNT)
ISN 0107     6001 FORMAT(1H1,5X,'MASS ',I3,3X,'EULER ANGLES(RADIAN)' //
                 *        1X,'TIME(SEC)',3X,'PHI',6X,'THETA',6X,'PSI')
ISN 0108          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,16),AM(ICNT,17),AM(ICNT,18))
ISN 0109      110 CONTINUE
ISN 0110          IF(JMASS(I,4) .EQ. 0) GO TO 120
ISN 0112          PRINT 6002, IM(ICNT)
ISN 0113     6002 FORMAT(1H1,5X,'MASS ',I3,3X,'VELOCITY(IN/SEC) - GROUND AXES' //
                 *        1X,'TIME(SEC)',2X,'XDOT',6X,'YDOT',6X,'ZDOT')
ISN 0114          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,4),AM(ICNT,5),AM(ICNT,6))
ISN 0115      120 CONTINUE
ISN 0116          IF(JMASS(I,5) .EQ. 0) GO TO 130
ISN 0118          PRINT 6003, IM(ICNT)
ISN 0119     6003 FORMAT(1H1,5X,'MASS ',I3,3X,'VELOCITY(IN/SEC) - MASS AXES' //
                 *        1X,'TIME(SEC)',4X,'U',9X,'V',9X,'W')
ISN 0120          CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,7),AM(ICNT,8),AM(ICNT,9))
ISN 0121      130 CONTINUE
ISN 0122          IF(JMASS(I,6) .EQ. 0) GO TO 140
ISN 0124          PRINT 6004, IM(ICNT)
ISN 0125     6004 FORMAT(1H1,5X,'MASS ',I3,3X,'ROTATIONAL VELOCITY(RAD/SEC)' //
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                   *       1X,'TIME(SEC)',4X,'P',9X,'Q',9X,'R')                  00001470
ISN 0126              CALL PLOTT(3,NDT,TM,AM(ICNT,19),AM(ICNT,20),AM(ICNT,21))   00001480
ISN 0127          140 CONTINUE                                                   00001490
ISN 0128              IF(JMASS(I,7) .EQ. 0) GO TO 150                            00001500
ISN 0130              PRINT 6005, IM(ICNT)                                       00001510
ISN 0131         6005 FORMAT(1H1,5X,'MASS ',I3,3X,'UNFILTERED ACCELERATION(G''S)'  00001520
                     *     // 1X,'TIME(SEC)',2X,'XACC',6X,'YACC',6X,'ZACC')      00001530
ISN 0132              CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,10),AM(ICNT,11),AM(ICNT,12))  00001540
ISN 0133          150 CONTINUE                                                   00001550
ISN 0134              IF(JMASS(I,8) .EQ. 0) GO TO 160                            00001560
ISN 0136              PRINT 6006, IM(ICNT)                                       00001570
ISN 0137         6006 FORMAT(1H1,5X,'MASS ',I3,3X,'FILTERED ACCELERATION(G''S)'   00001580
                     *     // 1X,'TIME(SEC)',2X,'XACCF',5X,'YACCF',5X,'ZACCF')   00001590
ISN 0138              CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,13),AM(ICNT,14),AM(ICNT,15))  00001600
ISN 0139          160 CONTINUE                                                   00001610
ISN 0140              IF(JMASS(I,9) .EQ. 0) GO TO 80                             00001620
ISN 0142              PRINT 6007, IM(ICNT)                                       00001630
ISN 0143         6007 FORMAT(1H1,5X,'MASS ',I3,3X,'ROTATIONAL ACCELERATION(RAD/SEC**2)' 00001640
                     *     // 1X,'TIME(SEC)',2X,'PDOT',6X,'QDOT',6X,'RDOT')      00001650
ISN 0144              CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,22),AM(ICNT,23),AM(ICNT,24))  00001660
ISN 0145           80 CONTINUE                                                   00001670
ISN 0146              IF(JMASS(I,10).EQ.0) GO TO 85                              00001680
ISN 0148              PRINT 6038,IM(ICNT)                                        00001690
ISN 0149         6038 FORMAT(1H1,5X,'MASS',I3,3X,'MASS IMPULSES'//1X,'TIME(SEC)',  00001700
                    1 2X,'XIMP',6X,'YIMP',6X,'ZIMP')                             00001710
ISN 0150              CALL PLOTT(3,NDT,TM(ICNT),AM(ICNT,25),AM(ICNT,26),AM(ICNT,27))  00001720
ISN 0151           85 CONTINUE                                                   00001730
ISN 0152           81 IF(NCNT .NE. 0) REWIND 12                                  00001740
ISN 0154           70 CONTINUE                                                   00001750
                C                                                                00001760
                C     PLOT NODE POINT DATA IF REQUESTED                          00001770
                C                                                                00001780
ISN 0155              IF(NNEP .LE. 0) GO TO 170                                  00001790
ISN 0157              PRINT 7030, NNEP                                           00001800
ISN 0158         7030 FORMAT (1H1,5X,I5,2X,'NODE PLOT FLAG SUMMARY')             00001810
ISN 0159              DO 7040 I=1, NNEP                                          00001820
ISN 0160              PRINT 7050,(JNODE(I,J),J=1,8)                              00001830
ISN 0161         7050 FORMAT (10X,8I8)                                           00001840
ISN 0162         7040 CONTINUE                                                   00001850
ISN 0163              REWIND 2                                                   00001860
ISN 0164              L = 1                                                      00001870
ISN 0165              ICNT = 0                                                   00001880
ISN 0166              NCNT = 0                                                   00001890
ISN 0167              DO 180 I=1, NNEP                                           00001900
ISN 0168              IFIND = 0                                                  00001910
ISN 0169              IF(NNEW .EQ. 0) GO TO 185                                  00001920
ISN 0171              DO 190 J=1, NDT                                            00001930
ISN 0172              DO 200 K=1, NNEW                                           00001940
ISN 0173              READ(2) (TN(L),DUMMY,INM(L),IN(L),(AN(L,M),DUMMY,M=1,18))  00001950
ISN 0174              IF(IN(L) .NE. JNODE(I,1) .OR. INM(L) .NE. JNODE(I,2)) GO TO 200  00001960
ISN 0176              IFIND = 1                                                  00001970
ISN 0177              L = L + 1                                                  00001980
ISN 0178              ICNT = ICNT + 1                                            00001990
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ISN 0179        200 CONTINUE                                                  00002000
ISN 0180        190 CONTINUE                                                  00002010
ISN 0181            IF(IFIND .EQ. 1) GO TO 195                                00002020
ISN 0183        185 PRINT 6024, JNODE(I,2),JNODE(I,1)                         00002030
ISN 0184       6024 FORMAT(1H1,5X,'19. UNABLE TO FIND DATA FOR MASS',I5,      00002040
                   *' NODE',I5,'. PLOTS FOR THIS NODE WILL BE SUPPRESSED.')   00002050
ISN 0185        195 IF((ICNT + NDT) .LE. 40) GO TO 210                        00002060
ISN 0187            NCNT = 1                                                  00002070
ISN 0188            DO 220 K=1, ICNT                                          00002080
ISN 0189            WRITE(12) (TN(K),INM(K),IN(K),(AN(K,M),M=1,18))           00002090
ISN 0190        220 CONTINUE                                                  00002100
ISN 0191            ICNT = 0                                                  00002110
ISN 0192            L = 1                                                     00002120
ISN 0193        210 CONTINUE                                                  00002130
ISN 0194            REWIND 2                                                  00002140
ISN 0195        180 CONTINUE                                                  00002150
ISN 0196            IF(ICNT .EQ. 40 .OR. NCNT .EQ. 0) GO TO 230               00002160
ISN 0198            DO 240 K=1, ICNT                                          00002170
ISN 0199            WRITE(12) (TN(K),INM(K),IN(K),(AN(K,M),M=1,18))           00002180
ISN 0200        240 CONTINUE                                                  00002190
ISN 0201        230 CONTINUE                                                  00002200
ISN 0202            IF(NCNT .NE. 0) REWIND 12                                 00002210
ISN 0204            IFIND = 0                                                 00002220
ISN 0205            IC = 0                                                    00002230
ISN 0206            DO 255 I=1, NNEP                                          00002240
ISN 0207            IF(IFIND .EQ. 1) GO TO 2030                               00002250
ISN 0209            IC = IC + 1                                               00002260
ISN 0210            IF(NCNT .EQ. 0) GO TO 2020                                00002270
ISN 0212            IF(IC .GT. NNEW) GO TO 251                                00002280
ISN 0214            ICNT = 1                                                  00002290
ISN 0215            DO 260 J=1, NDT                                           00002300
ISN 0216            READ(12) (TN(J),INM(J),IN(J),(AN(J,K),K=1,18))            00002310
ISN 0217        260 CONTINUE                                                  00002320
ISN 0218            GO TO 2030                                                00002330
ISN 0219       2020 ICNT = IC * NDT + 1 - NDT                                 00002340
ISN 0220       2030 CONTINUE                                                  00002350
ISN 0221            IF(INM(ICNT) .EQ. JNODE(I,2) .AND. IN(ICNT) .EQ. JNODE(I,1))  00002360
                   *  GO TO 265                                               00002370
ISN 0223            IFIND = 1                                                 00002380
ISN 0224            GO TO 250                                                 00002390
ISN 0225        265 IFIND = 0                                                 00002400
ISN 0226            IF(JNODE(I,3) .EQ. 0) GO TO 270                           00002410
ISN 0228            PRINT 6008, INM(ICNT),IN(ICNT)                            00002420
ISN 0229       6008 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'DISPLACEMENTS(IN)'  // 00002430
                   *       1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')               00002440
ISN 0230            CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,1),AN(ICNT,2),AN(ICNT,3))  00002450
ISN 0231        270 CONTINUE                                                  00002460
ISN 0232            IF(JNODE(I,4) .EQ. 0) GO TO 280                           00002470
ISN 0234            PRINT 6009, INM(ICNT),IN(ICNT)                            00002480
ISN 0235       6009 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'VELOCITY(IN/SEC) - GROU00002490
                   *ND AXES' // 1X,'TIME(SEC)',2X,'XDOT',6X,'YDOT',6X,'ZDOT')  00002500
ISN 0236            CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,4),AN(ICNT,5),AN(ICNT,6))  00002510
ISN 0237        280 CONTINUE                                                  00002520
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ISN 0238          IF(JNODE(I,5) .EQ. 0) GO TO 290
ISN 0240          PRINT 6010, INM(ICNT),IN(ICNT)
ISN 0241     6010 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'VELOCITY(IN/SEC) - MASS
                 * AXES' // 1X,'TIME(SEC)',4X,'U',9X,'V',9X,'W')
ISN 0242          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,7),AN(ICNT,8),AN(ICNT,9))
ISN 0243      290 CONTINUE
ISN 0244          IF(JNODE(I,6) .EQ. 0) GO TO 300
ISN 0246          PRINT 6011, INM(ICNT),IN(ICNT)
ISN 0247     6011 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'UNFILTERED ACCELERATION
                 *(G''S)' // 1X,'TIME(SEC)',2X,'XACC',6X,'YACC',6X,'ZACC')
ISN 0248          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,10),AN(ICNT,11),AN(ICNT,12))
ISN 0249      300 CONTINUE
ISN 0250          IF(JNODE(I,7) .EQ. 0) GO TO 250
ISN 0252          PRINT 6012, INM(ICNT),IN(ICNT)
ISN 0253     6012 FORMAT(1H1,5X,'MASS ',I3,3X,'NODE ',I3,3X,'FILTERED ACCELERATION(G
                 *''S)' // 1X,'TIME(SEC)',2X,'XACCF',5X,'YACCF',5X,'ZACCF')
ISN 0254          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,13),AN(ICNT,14),AN(ICNT,15))
ISN 0255      250 CONTINUE
ISN 0256          IF(JNODE(I,8).EQ.0) GO TO 255
ISN 0258          PRINT 6039,INM(ICNT),IN(ICNT)
ISN 0259     6039 FORMAT(1H1,5X,'MASS',I3,3X,'NODE',I3,3X,'NODE IMPULSES(G-SEC)'
                1 //1X,'TIME(SEC)',2X,'XIMPNP',5X,'YIMPNP',5X,'ZIMPNP')
ISN 0260          CALL PLOTT(3,NDT,TN(ICNT),AN(ICNT,16),AN(ICNT,17),AN(ICNT,18))
ISN 0261      255 CONTINUE
ISN 0262      251 IF(NCNT .NE. 0) REWIND 12
ISN 0264      170 CONTINUE
            C
            C     PLOT BEAM ELEMENT FORCE DATA IF REQUIRED
            C
ISN 0265          IF(NBFP .LE. 0) GO TO 320
ISN 0267          PRINT 7060, NBFP
ISN 0268     7060 FORMAT (1H1,5X,I5,2X,'BEAM FORCE PLOT FLAG SUMMARY')
ISN 0269          DO 7070 I=1, NBFP
ISN 0270          PRINT 7080, (JBMF(I,J), J=1, 4)
ISN 0271     7080 FORMAT (10X,4I8)
ISN 0272     7070 CONTINUE
ISN 0273          REWIND 3
ISN 0274          L = 1
ISN 0275          ICNT = 0
ISN 0276          NCNT = 0
ISN 0277          DO 330 I=1, NBFP
ISN 0278          IFIND = 0
ISN 0279          IF(NBFW .EQ. 0) GO TO 335
ISN 0281          DO 340 J=1, NDT
ISN 0282          DO 350 K=1, NBFW
ISN 0283          READ(3) (TB(L),DUMMY,IB(L),IBG(L),JBG(L),MBG(L),NBG(L),
                 *        (AB(L,M), DUMMY, M=1, 8))
ISN 0284          IF(IB(L) .NE. JBMF(I,1)) GO TO 350
ISN 0286          IFIND = 1
ISN 0287          L = L + 1
ISN 0288          ICNT = ICNT + 1
ISN 0289      350 CONTINUE
ISN 0290      340 CONTINUE
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ISN 0291          IF(IFIND .EQ. 1) GO TO 345                                  00003060
ISN 0293      335 PRINT 6025, JBMF(I,1)                                       00003070
ISN 0294     6025 FORMAT(1H1,5X,'20. UNABLE TO FIND DATA FOR BEAM',I5,        00003080
                *  '. FORCE PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')         00003090
ISN 0295      345 IF((ICNT + NDT) .LE. 50) GO TO 360                          00003100
ISN 0297          NCNT = 1                                                    00003110
ISN 0298          DO 370 K=1, ICNT                                            00003120
ISN 0299          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),(AB(K,M),00003130
                *            M=1, 8))                                         00003140
ISN 0300      370 CONTINUE                                                    00003150
ISN 0301          ICNT = 0                                                    00003160
ISN 0302          L = 1                                                       00003170
ISN 0303      360 CONTINUE                                                    00003180
ISN 0304          REWIND 3                                                    00003190
ISN 0305      330 CONTINUE                                                    00003200
ISN 0306          IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 380                 00003210
ISN 0308          DO 390 K=1, ICNT                                            00003220
ISN 0309          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),(AB(K,M),00003230
                *             M=1, 8))                                        00003240
ISN 0310      390 CONTINUE                                                    00003250
ISN 0311      380 CONTINUE                                                    00003260
ISN 0312          IF(NCNT .NE. 0) REWIND 12                                   00003270
ISN 0314          IFIND = 0                                                   00003280
ISN 0315          IC = 0                                                      00003290
ISN 0316          DO 400 I=1, NBFP                                            00003300
ISN 0317          IF(IFIND .EQ.1) GO TO 2050                                  00003310
ISN 0319          IC = IC + 1                                                 00003320
ISN 0320          IF(NCNT .EQ. 0) GO TO 2040                                  00003330
ISN 0322          IF(IC .GT. NBFW) GO TO 401                                  00003340
ISN 0324          ICNT = 1                                                    00003350
ISN 0325          DO 410 J=1, NDT                                             00003360
ISN 0326          READ(12) (TB(J),IB(J),IBG(J),JBG(J),MBG(J),NBG(J),(AB(J,M), 00003370
                *              M=1, 8))                                       00003380
ISN 0327      410 CONTINUE                                                    00003390
ISN 0328          GO TO 2050                                                  00003400
ISN 0329     2040 ICNT = IC * NDT + 1 - NDT                                   00003410
ISN 0330     2050 CONTINUE                                                    00003420
ISN 0331          IF(IB(ICNT) .EQ. JBMF(I,1)) GO TO 415                       00003430
ISN 0333          IFIND = 1                                                   00003440
ISN 0334          GO TO 400                                                   00003450
ISN 0335      415 IFIND = 0                                                   00003460
ISN 0336          IF(JBMF(I,2) .EQ. 0) GO TO 420                              00003470
ISN 0338          PRINT 6013, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)00003480
ISN 0339     6013 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00003490
                *      I2,5X,'AXIAL AND SHEAR FORCES(LB)' // 1X,'TIME(SEC)',3X,  00003500
                *      'FX',8X,'FY',8X,'FZ')                                  00003510
ISN 0340          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,1),AB(ICNT,2),AB(ICNT,3)) 00003520
ISN 0341      420 CONTINUE                                                    00003530
ISN 0342          IF(JBMF(I,3) .EQ. 0) GO TO 430                              00003540
ISN 0344          PRINT 6014, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)00003550
ISN 0345     6014 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00003560
                *      I2,5X,'MOMENTS AT I,M(IN-LB)' // 1X,'TIME(SEC)',       00003570
                *      3X,'MX',8X,'MY',8X,'MZ')                               00003580
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ISN 0346          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,5),AB(ICNT,7))        00003590
ISN 0347      430 CONTINUE                                                           00003600
ISN 0348          IF(JBMF(I,4) .EQ. 0) GO TO 400                                     00003610
ISN 0350          PRINT 6015, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)       00003620
ISN 0351     6015 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',',   00003630
                *        I2,5X,'MOMENTS AT J,N(IN-LB)' // 1X,'TIME(SEC)',            00003640
                *        3X,'MX',8X,'MY',8X,'MZ')                                    00003650
ISN 0352          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,6),AB(ICNT,8))        00003660
ISN 0353      400 CONTINUE                                                           00003670
ISN 0354      401 IF(NCNT .NE. 0) REWIND 12                                          00003680
ISN 0356      320 CONTINUE                                                           00003690
              C                                                                      00003700
              C   PLOT BEAM ELEMENT DEFLECTION DATA IF REQUIRED                      00003710
              C                                                                      00003720
ISN 0357          IF(NBDP .LE. 0) GO TO 440                                          00003730
ISN 0359          PRINT 7090, NBDP                                                   00003740
ISN 0360     7090 FORMAT (1H1,5X,I5,2X,'BEAM DEFLECTION PLOT FLAG SUMMARY')          00003750
ISN 0361          DO 7100 I=1, NBDP                                                  00003760
ISN 0362          PRINT 7080, (JBMD(I,J), J=1, 4)                                    00003770
ISN 0363     7100 CONTINUE                                                           00003780
ISN 0364          REWIND 4                                                           00003790
ISN 0365          L = 1                                                              00003800
ISN 0366          ICNT = 0                                                           00003810
ISN 0367          NCNT = 0                                                           00003820
ISN 0368          DO 450 I=1, NBDP                                                   00003830
ISN 0369          IFIND = 0                                                          00003840
ISN 0370          IF(NBDW .EQ. 0) GO TO 455                                          00003850
ISN 0372          DO 460 J=1, NDT                                                    00003860
ISN 0373          DO 470 K=1, NBDW                                                   00003870
ISN 0374          READ(4) (TB(L),DUMMY,IB(L),IBG(L),JBG(L),MBG(L),NBG(L),            00003880
                *         (AB(L,M),DUMMY, M=1, 8))                                   00003890
ISN 0375          IF(IB(L) .NE. JBMD(I,1)) GO TO 470                                 00003900
ISN 0377          IFIND = 1                                                          00003910
ISN 0378          L = L + 1                                                          00003920
ISN 0379          ICNT = ICNT + 1                                                    00003930
ISN 0380      470 CONTINUE                                                           00003940
ISN 0381      460 CONTINUE                                                           00003950
ISN 0382          IF(IFIND .EQ. 1) GO TO 465                                         00003960
ISN 0384      455 PRINT 6026, JBMD(I,1)                                              00003970
ISN 0385     6026 FORMAT(1H1,5X,'21. UNABLE TO FIND DATA FOR BEAM',I5,               00003980
                * '.  DEFLECTION PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')           00003990
ISN 0386      465 IF((ICNT + NDT) .LE. 50) GO TO 480                                 00004000
ISN 0388          NCNT = 1                                                           00004010
ISN 0389          DO 490 K=1, ICNT                                                   00004020
ISN 0390          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),                00004030
                *         (AB(K,M), M=1, 8))                                         00004040
ISN 0391      490 CONTINUE                                                           00004050
ISN 0392          ICNT = 0                                                           00004060
ISN 0393          L = 1                                                              00004070
ISN 0394      480 CONTINUE                                                           00004080
ISN 0395          REWIND 4                                                           00004090
ISN 0396      450 CONTINUE                                                           00004100
ISN 0397          IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 500                        00004110
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ISN 0399          DO 510 K=1, ICNT                                                00004120
ISN 0400          WRITE(12) (TB(K),IB(K),IBG(K),JBG(K),MBG(K),NBG(K),             00004130
                 *         (AB(K,M), M=1, 8))                                      00004140
ISN 0401      510 CONTINUE                                                        00004150
ISN 0402      500 CONTINUE                                                        00004160
ISN 0403          IF(NCNT .NE. 0) REWIND 12                                       00004170
ISN 0405          IFIND = 0                                                       00004180
ISN 0406          IC = 0                                                          00004190
ISN 0407          DO 520 I=1, NBDP                                                00004200
ISN 0408          IF(IFIND .EQ. 1) GO TO 2070                                     00004210
ISN 0410          IC = IC + 1                                                     00004220
ISN 0411          IF(NCNT .EQ. 0) GO TO 2060                                      00004230
ISN 0413          IF(IC .GT. NBDW) GO TO 521                                      00004240
ISN 0415          ICNT = 1                                                        00004250
ISN 0416          DO 530 J=1, NDT                                                 00004260
ISN 0417          READ(12) (TB(J),IB(J),IBG(J),JBG(J),MBG(J),NBG(J),              00004270
                 *        (AB(J,M), M=1, 8))                                      00004280
ISN 0418      530 CONTINUE                                                        00004290
ISN 0419          GO TO 2070                                                      00004300
ISN 0420     2060 ICNT = IC * NDT + 1 - NDT                                       00004310
ISN 0421     2070 CONTINUE                                                        00004320
ISN 0422          IF(IB(ICNT) .EQ. JBMD(I,1)) GO TO 535                           00004330
ISN 0424          IFIND = 1                                                       00004340
ISN 0425          GO TO 520                                                       00004350
ISN 0426      535 IFIND = 0                                                       00004360
ISN 0427          IF(JBMD(I,2) .EQ. 0) GO TO 540                                  00004370
ISN 0429          PRINT 6016, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)    00004380
ISN 0430     6016 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00004390
                 *       I2,5X,'RELATIVE DEFLECTIONS*J-I*(IN)' // 1X,'TIME(SEC)', 00004400
                 *       4X,'X',9X,'Y',9X,'Z')                                    00004410
ISN 0431          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,1),AB(ICNT,2),AB(ICNT,3))     00004420
ISN 0432      540 CONTINUE                                                        00004430
ISN 0433          IF(JBMD(I,3) .EQ. 0) GO TO 550                                  00004440
ISN 0435          PRINT 6017, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)    00004450
ISN 0436     6017 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00004460
                 *       I2,5X,'RELATIVE ROTATIONS*J-I*(DEGREE)'  // 1X,'TIME(SEC)',00004470
                 *       3X,'PHI',6X,'THETA',6X,'PSI')                            00004480
ISN 0437          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,5),AB(ICNT,6))     00004490
ISN 0438      550 CONTINUE                                                        00004500
ISN 0439          IF(JBMD(I,4) .EQ. 0) GO TO 520                                  00004510
ISN 0441          PRINT 6018, IB(ICNT),IBG(ICNT),MBG(ICNT),JBG(ICNT),NBG(ICNT)    00004520
ISN 0442     6018 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,'J,N =',I4,',', 00004530
                 *       I2,5X,'RELATIVE ROTATIONS*J+I*(DEGREE)' // 1X,'TIME(SEC)', 00004540
                 *       3X,'PHI',6X,'THETA',6X,'PSI')                            00004550
ISN 0443          CALL PLOTT(3,NDT,TB(ICNT),AB(ICNT,4),AB(ICNT,7),AB(ICNT,8))     00004560
ISN 0444      520 CONTINUE                                                        00004570
ISN 0445      521 IF(NCNT .NE. 0) REWIND 12                                       00004580
ISN 0447      440 CONTINUE                                                        00004590
              C                                                                   00004600
              C   PLOT BEAM STRESS DATA IF REQUIRED                               00004610
              C                                                                   00004620
ISN 0448          IF(NSTP .LE. 0) GO TO 850                                       00004630
ISN 0450          PRINT 7110, NSTP                                                00004640
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ISN 0451      7110 FORMAT (1H1,5X,I5,2X,'BEAM STRESS PLOT FLAG SUMMARY')
ISN 0452           DO 7120 I=1, NSTP
ISN 0453           PRINT 7130, (JBMS(I,J), J=1, 6)
ISN 0454      7130 FORMAT (10X,6I8)
ISN 0455      7120 CONTINUE
ISN 0456           REWIND 13
ISN 0457           L = 1
ISN 0458           ICNT = 0
ISN 0459           NCNT = 0
ISN 0460           DO 860 I=1, NSTP
ISN 0461           IFIND = 0
ISN 0462           IF(NSTW .EQ. 0) GO TO 865
ISN 0464           DO 870 J=1, NDT
ISN 0465           DO 880 K=1, NSTW
ISN 0466           READ(13) (TT(L),DUMMY,IT(L),ITG(L),JTG(L),MTG(L),NTG(L),
                *          (AT(L,M),DUMMY,M=1,10))
ISN 0467           IF(IT(L) .NE. JBMS(I,1)) GO TO 880
ISN 0469           IFIND = 1
ISN 0470           L = L + 1
ISN 0471           ICNT = ICNT + 1
ISN 0472       880 CONTINUE
ISN 0473       870 CONTINUE
ISN 0474           IF(IFIND .EQ. 1) GO TO 875
ISN 0476       865 PRINT 6029, JBMS(I,1)
ISN 0477      6029 FORMAT(1H1,5X,'22. UNABLE TO FIND DATA FOR BEAM',I5,
                *  '.  STRESS PLOTS FOR THIS BEAM WILL BE SUPPRESSED.')
ISN 0478       875 IF((ICNT + NDT) .LE. 50) GO TO 890
ISN 0480           NCNT = 1
ISN 0481           DO 900 K=1, ICNT
ISN 0482           WRITE(12) (TT(K),IT(K),ITG(K),JTG(K),MTG(K),NTG(K),
                *            (AT(K,M),M=1,10))
ISN 0483       900 CONTINUE
ISN 0484           ICNT = 0
ISN 0485           L = 1
ISN 0486       890 CONTINUE
ISN 0487           REWIND 13
ISN 0488       860 CONTINUE
ISN 0489           IF(ICNT .EQ. 50 .OR. NCNT .EQ. 0) GO TO 910
ISN 0491           DO 920 K=1, ICNT
ISN 0492           WRITE(12) (TT(K),IT(K),ITG(K),JTG(K),MTG(K),NTG(K),
                *            (AT(K,M),M=1,10))
ISN 0493       920 CONTINUE
ISN 0494       910 CONTINUE
ISN 0495           IF(NCNT .NE. 0) REWIND 12
ISN 0497           IFIND = 0
ISN 0498           IC = 0
ISN 0499           DO 930 I=1, NSTP
ISN 0500           IF(IFIND .EQ.1) GO TO 2090
ISN 0502           IC = IC + 1
ISN 0503           IF(NCNT .EQ. 0) GO TO 2080
ISN 0505           IF(IC .GT. NSTW) GO TO 931
ISN 0507           ICNT = 1
ISN 0508           DO 940 J=1, NDT
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ISN 0509          READ(12) (TT(J),IT(J),ITG(J),JTG(J),MTG(J),NTG(J),                00005180
                 *          (AT(J,M),M=1,10))                                         00005190
ISN 0510      940 CONTINUE                                                            00005200
ISN 0511          GO TO 2090                                                          00005210
ISN 0512     2080 ICNT = IC * NDT + 1 - NDT                                           00005220
ISN 0513     2090 CONTINUE                                                            00005230
ISN 0514          IF(IT(ICNT) .EQ. JBMS(I,1)) GO TO 945                               00005240
ISN 0516          IFIND = 1                                                           00005250
ISN 0517          GO TO 930                                                           00005260
ISN 0518      945 IFIND = 0                                                           00005270
ISN 0519          IF(JBMS(I,2) .EQ. 0) GO TO 950                                      00005280
ISN 0521          PRINT 6070, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)        00005290
ISN 0522     6070 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,                   00005300
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (MAXIMUM SHEAR STRESS THEORY) A00005310
                 *T TOP AND BOTTOM OF BEAM' // 1X,'TIME(SEC)',3X,'TOP',6X,'BOTTOM') 00005320
ISN 0523          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,1),AT(ICNT,2),TT(ICNT))           00005330
ISN 0524      950 CONTINUE                                                            00005340
ISN 0525          IF(JBMS(I,3) .EQ. 0) GO TO 960                                      00005350
ISN 0527          PRINT 6080, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)        00005360
ISN 0528     6080 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,                   00005370
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (MAXIMUM SHEAR STRESS THEORY) A00005380
                 *T LEFT AND RIGHT EDGE OF BEAM' // 1X,'TIME(SEC)',3X,'LEFT',5X,      00005390
                 *'RIGHT')                                                            00005400
ISN 0529          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,3),AT(ICNT,4),TT(ICNT))           00005410
ISN 0530      960 CONTINUE                                                            00005420
ISN 0531          IF(JBMS(I,4) .EQ. 0) GO TO 970                                      00005430
ISN 0533          PRINT 6090, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)        00005440
ISN 0534     6090 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,                   00005450
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (THEORY OF CONST. ENERGY OF DIS00005460
                 *T.) AT TOP AND BOTTOM OF BEAM' // 1X,'TIME(SEC)',                   00005470
                 *3X,'TOP',6X,'BOTTOM')                                               00005480
ISN 0535          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,5),AT(ICNT,6),TT(ICNT))           00005490
ISN 0536      970 CONTINUE                                                            00005500
ISN 0537          IF(JBMS(I,5) .EQ. 0) GO TO 980                                      00005510
ISN 0539          PRINT 6100, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)        00005520
ISN 0540     6100 FORMAT(1H1,5X,'BEAM ',I3,3X,'I,M =',I4,',',I2,5X,                   00005530
                 *'J,N =',I4,',',I2,5X,'STRESS RATIO (THEORY OF CONST. ENERGY OF DIS00005540
                 *T.) AT LEFT AND RIGHT EDGE OF BEAM' // 1X,'TIME(SEC)',              00005550
                 *3X,'LEFT',5X,'RIGHT')                                               00005560
ISN 0541          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,7),AT(ICNT,8),TT(ICNT))           00005570
ISN 0542      980 IF(JBMS(I,6) .EQ. 0) GO TO 930                                      00005580
ISN 0544          PRINT 6110, IT(ICNT),ITG(ICNT),MTG(ICNT),JTG(ICNT),NTG(ICNT)        00005590
ISN 0545     6110 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M =',I4,',',I2,5X,                    00005600
                 *'J,N =',I4,',',I2,5X,'AXIAL STRESS AND BUCKLING LOAD RATIOS' //     00005610
                 *1X,'TIME(SEC)',2X,'AXIAL',4X,'BUCKLING' / 11X,                      00005620
                 *'STRESS',5X,'LOAD')                                                 00005630
ISN 0546          CALL PLOTT(2,NDT,TT(ICNT),AT(ICNT,9),AT(ICNT,10),TT(ICNT))          00005640
ISN 0547      930 CONTINUE                                                            00005650
ISN 0548      931 IF(NCNT .NE. 0) REWIND 12                                           00005660
ISN 0550      850 CONTINUE                                                            00005670
            C                                                                         00005680
            C     PLOT EXTERNAL SPRING DATA IF REQUIRED                               00005690
            C                                                                         00005700
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ISN 0551          IF(NSEP .EQ. 0) GO TO 580
ISN 0553          PRINT 7140, NSEP
ISN 0554     7140 FORMAT (1H1,5X,I5,2X,'EXTERNAL SPRING PLOT FLAG SUMMARY')
ISN 0555          DO 7150 I=1, NSEP
ISN 0556          PRINT 7080, (JSPR(I,J), J=1, 4)
ISN 0557     7150 CONTINUE
ISN 0558          REWIND 8
ISN 0559          L = 1
ISN 0560          ICNT = 0
ISN 0561          NCNT = 0
ISN 0562          DO 545 I=1, 40
ISN 0563          DO 545 J=1, 6
ISN 0564          AS(I,J) = 0.0
ISN 0565      545 CONTINUE
ISN 0566          DO 555 I=1, NSEP
ISN 0567          IFIND = 0
ISN 0568          IF(NSEW .EQ. 0) GO TO 556
ISN 0570          DO 560 J=1, NDT
ISN 0571          DO 570 K=1, NSEW
ISN 0572          READ(8) (TSD,DUMMY,JSM,JSK,JSN,ADUM1,DUMMY,ADUM2,DUMMY)
ISN 0573          IF(JSM .NE. JSPR(I,1) .OR. JSN .NE. JSPR(I,2)) GO TO 570
ISN 0575          IFIND = 1
ISN 0576          TS(L) = TSD
ISN 0577          ISM(L) = JSM
ISN 0578          ISN(L) =JSN
ISN 0579          AS(L,JSK) = ADUM1
ISN 0580          AS(L,JSK+3) = ADUM2
ISN 0581      570 CONTINUE
ISN 0582          L = L + 1
ISN 0583          ICNT = ICNT + 1
ISN 0584      560 CONTINUE
ISN 0585          IF(IFIND .EQ. 1) GO TO 565
ISN 0587      556 PRINT 6027, JSPR(I,1),JSPR(I,2)
ISN 0588     6027 FORMAT(1H1,5X,'23. UNABLE TO FIND DATA FOR SPRING',I5,
                * ' NODE',I5,'. PLOTS FOR THIS SPRING WILL BE SUPPRESSED.')
ISN 0589      565 IF((ICNT + NDT) .LE. 40) GO TO 590
ISN 0591          NCNT = 1
ISN 0592          DO 600 K=1, ICNT
ISN 0593          WRITE(12) (TS(K),ISM(K),ISN(K),(AS(K,M), M=1, 6))
ISN 0594      600 CONTINUE
ISN 0595          ICNT = 0
ISN 0596          L = 1
ISN 0597      590 CONTINUE
ISN 0598          REWIND 8
ISN 0599      555 CONTINUE
ISN 0600          IF(ICNT .EQ. 40 .OR. NCNT .EQ. 0) GO TO 610
ISN 0602          DO 620 K=1, ICNT
ISN 0603          WRITE(12) (TS(K),ISM(K),ISN(K),(AS(K,M), M=1, 6))
ISN 0604      620 CONTINUE
ISN 0605      610 CONTINUE
ISN 0606          IF(NCNT .NE. 0) REWIND 12
ISN 0608          IFIND = 0
ISN 0609          IC = 0
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ISN 0610         DO 630 I=1, NSEP
ISN 0611         IF(IFIND .EQ. 1) GO TO 2110
ISN 0613         IC = IC + 1
ISN 0614         IF(NCNT .EQ. 0) GO TO 2100
ISN 0616         IF(IC .GT. NSEW) GO TO 631
ISN 0618         ICNT = 1
ISN 0619         DO 640 J=1, NDT
ISN 0620         READ(12) (TS(J),ISM(J),ISN(J),(AS(J,M), M=1, 6))
ISN 0621     640 CONTINUE
ISN 0622         GO TO 2110
ISN 0623    2100 ICNT = IC * NDT + 1 - NDT
ISN 0624    2110 CONTINUE
ISN 0625         IF(ISM(ICNT) .EQ. JSPR(I,1) .AND. ISN(ICNT) .EQ. JSPR(I,2))
                *   GO TO 645
ISN 0627         IFIND = 1
ISN 0628         GO TO 630
ISN 0629     645 IFIND = 0
ISN 0630         IF(JSPR(I,3) .EQ. 0) GO TO 650
ISN 0632         PRINT 6019, ISM(ICNT),ISN(ICNT)
ISN 0633    6019 FORMAT(1H1,5X,'EXTERNAL SPRING   I,M =',I4,',',I2,5X,
                *        'COMPRESSION(IN)' // 1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')
ISN 0634         CALL PLOTT(3,NDT,TS(ICNT),AS(ICNT,1),AS(ICNT,2),AS(ICNT,3))
ISN 0635     650 CONTINUE
ISN 0636         IF(JSPR(I,4) .EQ. 0) GO TO 630
ISN 0638         PRINT 6020, ISM(ICNT),ISN(ICNT)
ISN 0639    6020 FORMAT(1H1,5X,'EXTERNAL SPRING   I,M =',I4,',',I2,5X,
                *       'AXIAL LOAD(LB)' // 1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')
ISN 0640         CALL PLOTT(3,NDT,TS(ICNT),AS(ICNT,4),AS(ICNT,5),AS(ICNT,6))
ISN 0641     630 CONTINUE
ISN 0642     631 IF(NCNT .NE. 0) REWIND 12
ISN 0644     580 CONTINUE
           C
           C     PLOT STRAIN&DAMPING ENERGY
           C
ISN 0645         IF(NENP.EQ.0) GO TO 581
ISN 0647         PRINT 7161,NENP
ISN 0648    7161 FORMAT(1H1,5X,I5,2X,'STRAIN AND DAMPING PLOT FLAG SUMMARY')
ISN 0649         DO 7162 I=1,NENP
ISN 0650         PRINT 7080,(JENG(I,J),J=1,3)
ISN 0651    7081 FORMAT(10X,3I8)
ISN 0652    7162 CONTINUE
ISN 0653         REWIND 11
ISN 0654         L=1
ISN 0655         ICNT=0
ISN 0656         NCNT=0
ISN 0657         DO 331 I=1,NENP
ISN 0658         IFIND=0
ISN 0659         IF(NENW.EQ.0) GO TO 336
ISN 0661         DO 341 J=1,NDT
ISN 0662         DO 351 K=1,NENW
ISN 0663         READ(11) (TE(L),DUMMY,IE(L),IEG(L),MEG(L),JEG(L),NEG(L),
               1 (AE(L,M),DUMMY,M=1,4))
ISN 0664         IF(IE(L).NE.JENG(I,1)) GO TO 351
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ISN 0666          IFIND=1                                                        00006770
ISN 0667          L=L+1                                                          00006780
ISN 0668          ICNT=ICNT+1                                                    00006790
ISN 0669      351 CONTINUE                                                       00006800
ISN 0670      341 CONTINUE                                                       00006810
ISN 0671          IF(IFIND.EQ.1) GO TO 346                                       00006820
ISN 0673      336 PRINT 6040,JENG(I,1)                                           00006830
ISN 0674     6040 FORMAT(1H1,5X,'26.UNABLE TO FIND DATA FOR BEAM',I5,'.ENERGY PLOTS 00006840
                 1 FOR THIS BEAM WILL BE SUPPRESSED.')                           00006850
ISN 0675      346 IF((ICNT+NDT).LE.50) GO TO 361                                 00006860
ISN 0677          NCNT=1                                                         00006870
ISN 0678          DO 371 K=1,ICNT                                                00006880
ISN 0679          WRITE(12) (TE(K),IE(K),IEG(K),MEG(K),JEG(K),NEG(K),            00006890
                 1 (AE(L,M),M=1,4))                                              00006900
ISN 0680      371 CONTINUE                                                       00006910
ISN 0681          ICNT=0                                                         00006920
ISN 0682          L=1                                                            00006930
ISN 0683      361 CONTINUE                                                       00006940
ISN 0684          REWIND 11                                                      00006950
ISN 0685      331 CONTINUE                                                       00006960
ISN 0686          IF(ICNT.EQ.50.OR.NCNT.EQ.0) GO TO 381                          00006970
ISN 0688          DO 391 K=1,ICNT                                                00006980
ISN 0689          WRITE(12) (TE(K),IE(K),MEG(K),JEG(K),NEG(K),                   00006990
                 1 (AE(L,M),M=1,4))                                              00007000
ISN 0690      391 CONTINUE                                                       00007010
ISN 0691      381 CONTINUE                                                       00007020
ISN 0692          IF(NCNT.NE.0) REWIND 12                                        00007030
ISN 0694          IFIND=0                                                        00007040
ISN 0695          IC=0                                                           00007050
ISN 0696          DO 402 I=1,NENP                                                00007060
ISN 0697          IF(IFIND.EQ.1) GO TO 2051                                      00007070
ISN 0699          IC=IC+1                                                        00007080
ISN 0700          IF(NCNT.EQ.0) GO TO 2041                                       00007090
ISN 0702          IF(IC.GT.NENW) GO TO 403                                       00007100
ISN 0704          ICNT=1                                                         00007110
ISN 0705          DO 411 J=1,NDT                                                 00007120
ISN 0706          READ(12) (TE(J),IE(J),IEG(J),MEG(J),JEG(J),NEG(J),             00007130
                 1 (AE(J,M),M=1,4))                                              00007140
ISN 0707      411 CONTINUE                                                       00007150
ISN 0708          GO TO 2051                                                     00007160
ISN 0709     2041 ICNT=IC*NDT+1-NDT                                              00007170
ISN 0710     2051 CONTINUE                                                       00007180
ISN 0711          IF(IE(ICNT).EQ.JENG(I,1)) GO TO 416                            00007190
ISN 0713          IFIND=1                                                        00007200
ISN 0714          GO TO 402                                                      00007210
ISN 0715      416 IFIND=0                                                        00007220
ISN 0716          IF(JENG(I,2).EQ.0) GO TO 421                                   00007230
ISN 0718          PRINT 6050,IE(ICNT),IEG(ICNT),MEG(ICNT),JEG(ICNT),NEG(ICNT)    00007240
ISN 0719     6050 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M=',I4,',',I2,5X,'J,N=',I4,',',I2, 00007250
                 1 5X,'STRAIN ENERGY AND PERCENT'//1X,'TIME(SEC)',3X,'SE',8X,    00007260
                 2 '%')                                                          00007270
ISN 0720          CALL PLOTT(2,NDT,TE(ICNT),AE(ICNT,1),AE(ICNT,2))               00007280
ISN 0721      421 CONTINUE                                                       00007290
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ISN 0722           IF(JENG(I,3).EQ.0) GO TO 431                                00007300
ISN 0724           PRINT 6051,IE(ICNT),IEG(ICNT),MEG(ICNT),JEG(ICNT),NEG(ICNT)  00007310
ISN 0725      6051 FORMAT(1H1,5X,'BEAM',I3,3X,'I,M=',I4,',',I2,5X,'J,N=',I4,    00007320
                  1 ',',I2,5X,'DAMPING ENERGY AND PERCENT'// 1X,'TIME(SEC)',3X, 00007330
                  2 'DE',8X,'%')                                                00007340
ISN 0726           CALL PLOTT(2,NDT,TE(ICNT),AE(ICNT,3),AE(ICNT,4))             00007350
ISN 0727       431 CONTINUE                                                     00007360
ISN 0728       402 CONTINUE                                                     00007370
ISN 0729       403 IF(NCNT.NE.0) REWIND 12                                      00007380
ISN 0731       581 CONTINUE                                                     00007390
              C                                                                 00007400
              C    PLOT DRI MASS DATA IF REQUIRED                               00007410
              C                                                                 00007420
ISN 0732           IF(NDRP .EQ. 0) GO TO 660                                    00007430
ISN 0734           PRINT 7160, NDRP                                             00007440
ISN 0735      7160 FORMAT (1H1,5X,I5,2X,'DRI PLOT FLAG SUMMARY')                00007450
ISN 0736           DO 7170 I=1, NDRP                                            00007460
ISN 0737           PRINT 7180, (JDRI(I))                                        00007470
ISN 0738      7180 FORMAT (10X,I8)                                              00007480
ISN 0739      7170 CONTINUE                                                     00007490
ISN 0740           REWIND 9                                                     00007500
ISN 0741           L = 1                                                        00007510
ISN 0742           ICNT = 0                                                     00007520
ISN 0743           NCNT = 0                                                     00007530
ISN 0744           DO 670 I=1, NDRP                                             00007540
ISN 0745           IFIND = 0                                                    00007550
ISN 0746           IF(NDRW .EQ. 0) GO TO 675                                    00007560
ISN 0748           DO 680 J=1, NDT                                              00007570
ISN 0749           DO 690 K=1, NDRW                                             00007580
ISN 0750           READ(9) (TD(L),DUMMY,IDM(L),AD(L),DUMMY)                     00007590
ISN 0751           IF(IDM(L) .NE. JDRI(I)) GO TO 690                            00007600
ISN 0753           IFIND = 1                                                    00007610
ISN 0754           L = L + 1                                                    00007620
ISN 0755           ICNT = ICNT + 1                                              00007630
ISN 0756       690 CONTINUE                                                     00007640
ISN 0757       680 CONTINUE                                                     00007650
ISN 0758           IF(IFIND .EQ. 1) GO TO 685                                   00007660
ISN 0760       675 PRINT 6028, JDRI(I)                                          00007670
ISN 0761      6028 FORMAT(1H1,5X,'24. UNABLE TO FIND DATA FOR DRI MASS',I5,     00007680
                  * '. PLOTS FOR THIS DRI MASS WILL BE SUPPRESSED.')            00007690
ISN 0762       685 IF((ICNT + NDT) .LE. 100) GO TO 700                          00007700
ISN 0764           NCNT = 1                                                     00007710
ISN 0765           DO 710 K=1, ICNT                                             00007720
ISN 0766           WRITE(12) (TD(K),IDM(K),AD(K))                               00007730
ISN 0767       710 CONTINUE                                                     00007740
ISN 0768           ICNT = 0                                                     00007750
ISN 0769           L = 1                                                        00007760
ISN 0770       700 CONTINUE                                                     00007770
ISN 0771           REWIND 9                                                     00007780
ISN 0772       670 CONTINUE                                                     00007790
ISN 0773           IF(ICNT .EQ. 100 .OR. NCNT .EQ. 0) GO TO 720                 00007800
ISN 0775           DO 730 K=1, ICNT                                             00007810
ISN 0776           WRITE(12) (TD(K),IDM(K),AD(K))                               00007820
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ISN 0777       730 CONTINUE                                                   00007830
ISN 0778       720 CONTINUE                                                   00007840
ISN 0779           IF(NCNT .NE. 0) REWIND 12                                  00007850
ISN 0781           IFIND = 0                                                  00007860
ISN 0782           IC = 0                                                     00007870
ISN 0783           DO 740 I=1, NDRP                                           00007880
ISN 0784           IF(IFIND .EQ. 1) GO TO 2130                                00007890
ISN 0786           IC = IC + 1                                                00007900
ISN 0787           IF(NCNT .EQ. 0) GO TO 2120                                 00007910
ISN 0789           IF(IC .GT. NDRW) GO TO 741                                 00007920
ISN 0791           ICNT = 1                                                   00007930
ISN 0792           DO 750 J=1, NDT                                            00007940
ISN 0793           READ(12) (TD(J),IDM(J),AD(J))                              00007950
ISN 0794       750 CONTINUE                                                   00007960
ISN 0795           GO TO 2130                                                 00007970
ISN 0796      2120 ICNT = IC * NDT + 1 - NDT                                  00007980
ISN 0797      2130 CONTINUE                                                   00007990
ISN 0798           IF(IDM(ICNT) .EQ. JDRI(I)) GO TO 755                       00008000
ISN 0800           IFIND = 1                                                  00008010
ISN 0801           GO TO 740                                                  00008020
ISN 0802       755 IFIND = 0                                                  00008030
ISN 0803           IF(JDRI(I) .EQ. 0) GO TO 740                               00008040
ISN 0805           PRINT 6021, IDM(ICNT)                                      00008050
ISN 0806      6021 FORMAT(1H1,5X,'DRI MASS ',I3 // 1X,'TIME(SEC)',3X,'DRI')   00008060
ISN 0807           CALL PLOTT(1,NDT,TD(ICNT),AD(ICNT),TD(ICNT),TD(ICNT))      00008070
ISN 0808       740 CONTINUE                                                   00008080
ISN 0809       741 IF(NCNT .NE. 0) REWIND 12                                  00008090
ISN 0811       660 CONTINUE                                                   00008100
              C                                                               00008110
              C    PLOT VEHICLE C.G. DATA                                     00008120
              C                                                               00008130
ISN 0812           REWIND 10                                                  00008140
ISN 0813           DO 760 I=1, NDT                                            00008150
ISN 0814           READ(10,ERR=999) (TV(I),DUMMY,(AV(I,M),DUMMY, M=1, 3))     00008160
ISN 0815       760 CONTINUE                                                   00008170
ISN 0816           ICNT = 1                                                   00008180
ISN 0817           PRINT 6022                                                 00008190
ISN 0818      6022 FORMAT(1H1,5X,'VEHICLE C.G. VELOCITY(IN/SEC)' //           00008200
                *         1X,'TIME(SEC)',4X,'X',9X,'Y',9X,'Z')                00008210
ISN 0819           CALL PLOTT(3,NDT,TV(ICNT),AV(1,1),AV(1,2),AV(1,3))         00008220
ISN 0820       800 CONTINUE                                                   00008230
ISN 0821           RETURN                                                     00008240
ISN 0822       999 CONTINUE                                                   00008250
ISN 0823           PRINT 1000,I,NDT                                           00008260
ISN 0824           PRINT 1003                                                 00008270
ISN 0825           DO 998 I1=1,I                                              00008280
ISN 0826       998   PRINT 1001,TV(I1),(AV(I1,M),M=1,3)                       00008290
ISN 0827           RETURN                                                     00008300
ISN 0828      1000 FORMAT(/// '25. ***ERROR PLOT***' / 10X,'I = ',I4,5X,      00008310
                *        'NDT = ',I4)                                         00008320
ISN 0829      1001 FORMAT(1X,1P4E15.5)                                        00008330
ISN 0830      1003 FORMAT(// 10X,'TVI   ',7X,'AV(I1,1)',7X,'AV(I1,2)',7X,'AV(I1,3)') 00008340
ISN 0831           END                                                        00008350
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     COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                        SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C     DATA SET D2334PRINT AT LEVEL 022 AS OF 06/25/79
               C     DATA SET D2332XPR   AT LEVEL 012 AS OF 05/22/78                00000010
               C     DATA SET D2332FPR   AT LEVEL 006 AS OF 02/08/78                00000020
ISN 0002             SUBROUTINE PRINT                                               00000030
               C                                                                    00000040
ISN 0003             IMPLICIT REAL*8 (A-H,O-Z)                                      00000050
ISN 0004             REAL*8 KUN,KEI,KETOTL,MINDT                                    00000060
ISN 0005             REAL*4 ENGSMY(6,200),ETIME(200)                                00000070
ISN 0006             REAL*4 XKS,XKI,XKR,CLTEST                                      00000080
ISN 0007             INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)                    00000090
ISN 0008             INTEGER*4 TITLE(40)                                            00000100
ISN 0009             INTEGER*2 NTOL1,NTOL2,NTOL3                                    00000110
ISN 0010             INTEGER*2 NLSFLG,CHUG,N1,NN,IG,JG,IEER,IESE,IEPSE,IEDE,IEPDE   00000120
ISN 0011             INTEGER*2 IECE,IEPCE,IEFE,IEPFE,IEDEV,IETOT                    00000130
ISN 0012             INTEGER*2 IJPR,INBUFF,II(40),KK(40)                            00000140
ISN 0013             INTEGER*2 NPLT,NPFCT,IPFCT,ITPL,NMPTS,MNUM,ISCALE              00000150
ISN 0014             INTEGER*2 MM(40),MG(150),NG(150),INP(50),MNP(50)               00000160
ISN 0015             INTEGER*2 NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,             00000170
                    *      JMASS(50,10),JNODE(50,8),JBMF(50,4),JBMD(50,4),          00000180
                    *      JBMS(50,6),JSPR(50,4),JENG(50,3),JDRI(10),               00000190
                    *      NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT           00000200
ISN 0016             DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)   00000210
ISN 0017             DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)00000220
ISN 0018             DIMENSION VEE2(6,150),TEMP(7),DEV(200)                         00000230
ISN 0019             DIMENSION IPLN(15)                                             00000240
ISN 0020             DIMENSION A(50),B(50)                                          00000250
ISN 0021             COMMON/PPLTS/ XSCALE(10),YSCALE(10),NPLT,NPFCT,IPFCT,ITPL(10), 00000260
                    *         NMPTS(10),MNUM(50,10),ISCALE(10)                      00000270
ISN 0022             COMMON/CFPR/FSPRNG(40,8),DELG(40)                              00000280
ISN 0023             COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),       00000290
                    1         FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)     00000300
ISN 0024             COMMON/DEIC/ WTOT,CLTEST(150)                                  00000310
ISN 0025             COMMON/DEIN/ XNBAR,XFBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),  00000320
                    1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000330
                    2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180), 00000340
                    3 MVP                                                           00000350
ISN 0026             COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),        00000360
                    1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150), 00000370
                    2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN                  00000380
ISN 0027             COMMON/DEMA/ DEVMAX                                            00000390
ISN 0028             COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),    00000400
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                1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)          00000410
ISN 0029          COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),     00000420
                1              XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,       00000430
                2              PETOTL,SETOTL,DETOTL,CETOTL,FETOTL                   00000440
ISN 0030          COMMON/INIDCP/ YDP(80)                                            00000450
ISN 0031          COMMON/INPR/  NDRI,NSP                                            00000460
ISN 0032          COMMON/MAPR/ ETOTTO,ENGSMY,INGSCT                                 00000470
ISN 0033          COMMON/MAPR1/ DEV,ETIME,IEER,IESE,IEPSE,IEDE,IEPDE,IECE,IEPCE,    00000480
                1 IEFE,IEPFE,IEDEV,IETOT                                            00000490
ISN 0034          COMMON/MCFIII/ SYMFLG                                             00000500
ISN 0035          COMMON/NP00I2/ MG,NG,INP,MNP                                      00000510
ISN 0036          COMMON/NP01I2/ II,KK,MM                                           00000520
ISN 0037          COMMON/NP00I4/ NNP                                                00000530
ISN 0038          COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,            00000540
                1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)                         00000550
ISN 0039          COMMON/INOUT/ FCUT,NTOL1,NTOL2,NTOL3                              00000560
ISN 0040          COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),    00000570
                1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),      00000580
                2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),           00000590
                3 YIMNPL(50),ZIMNPL(50)                                             00000600
ISN 0041          COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),00000610
                1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),             00000620
                2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),            00000630
                3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),     00000640
                4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),   00000650
                5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,   00000660
                6 XACC(80),YACC(80),ZACC(80),AIDOT(9),                              00000670
                7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,              00000680
                8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),            00000690
                9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),          00000700
                A CEIKF(40),                                                        00000710
                B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,                             00000720
                C NM,NB,I,J,IG(150),JG(150),                                        00000730
                D N1(900),NN(40),IJPR(150)                                          00000740
ISN 0042          COMMON/ININPR/ NSF,NTF,NDE,NSPD,NED,NS,NRP,NIMP                   00000750
ISN 0043          COMMON/OTPLT/ NMEP,NNEP,NBFP,NBDP,NSEP,NDRP,NSTP,NENP,            00000760
                *             JMASS,JNODE,JBMF,JBMD,JBMS,JSPR,JENG,JDRI,            00000770
                *             NMEW,NNEW,NBFW,NBDW,NSEW,NDRW,NSTW,NENW,NPRINT        00000780
ISN 0044          COMMON /MAX/ IRUPSW(150),IPENSW(80),VEEBAR(900),ZINIT(80),        00000790
                1            DPHIIJ(150),FUB(150)                                   00000800
ISN 0045          COMMON /VARINT/ MINDT,DT2,TPRINT,EL,EU,RATMIN,RATMAX,IPC,IVAR     00000810
ISN 0046          EQUIVALENCE (VEE(1),VEE2(1,1))                                    00000820
ISN 0047          DATA IPLN /                                                       00000830
                *'X(+AFT) - Y(+RIGHT) X(+AFT) - Z(+UP)    Y(+RIGHT) - Z(+UP)  ' /   00000840
ISN 0048          ILINES = 60                                                       00000850
ISN 0049          IPL = 6                                                           00000860
ISN 0050          IF(NRP .LE. 0) IPL = 2                                            00000870
ISN 0052          ITTL = 9                                                          00000880
          C FORCE NEW PAGE                                                          00000890
ISN 0053          NPR = 1000                                                        00000900
ISN 0054          DO 3099 I = 1,NM                                                  00000910
ISN 0055          IF (ILINES-NPR-IPL) 3010,3020,3020                                00000920
ISN 0056     3010 PRINT 3100,TITLE                                                  00000930
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ISN 0057     3100 FORMAT(1H1,20A4 / 1X,20A4 / )
ISN 0058          PRINT 3200,TIME,IPC
ISN 0059     3200 FORMAT(1H ,6HTIME =,F9.6,5X,'NUMBER OF INTEGRATION INTERVALS =',
                 1 I4/)
ISN 0060          IF(NRP .GT. 0) PRINT 3201
ISN 0062          IF(NRP .LE. 0) PRINT 3214
ISN 0064     3201 FORMAT(1X,'MASS DISPLACEMENTS,VELOCITIES,AND ACCELERATIONS' / )
ISN 0065     3214 FORMAT(1X,'NO MASS RESPONSE DATA REQUESTED EXCEPT TRANSLATIONAL AC
                 *CELERATIONS' / )
ISN 0066          IF(NRP .LE. 0) GO TO 3018
ISN 0068          PRINT 3300
ISN 0069          PRINT 400
ISN 0070          PRINT 500
ISN 0071          PRINT 600
ISN 0072     3018 PRINT 900
ISN 0073     3300 FORMAT(1H ,18X,1HX,14X,1HY,14X,1HZ,13X,3HPHI,11X,5HTHETA,
                 1  11X,3HPSI)
ISN 0074      400 FORMAT(1H ,17X,4HXDOT,11X,4HYDOT,11X,4HZDOT,10X,6HPHIDOT,
                 1  8X,8HTHETADOT,8X,6HPSIDOT)
ISN 0075      500 FORMAT(1H ,18X,1HU,14X,1HV,14X,1HW,14X,1HP,14X,1HQ,14X,1HR)
ISN 0076      600 FORMAT(1H ,17X,4HUDOT,11X,4HVDOT,11X,4HWDOT,11X,4HPDOT,11X,
                 1  4HQDOT,11X,4HRDOT)
ISN 0077      900 FORMAT (1H ,16X,6HXACCEL,9X,6HYACCEL,9X,6HZACCEL,
                 1 9X,6HXACFIL,9X,6HYACFIL,9X,6HZACFIL /)
ISN 0078          NPR = ITTL
ISN 0079     3020 NPR = NPR+IPL
ISN 0080          IF(NRP .LE. 0) GO TO 788
ISN 0082          PRINT 700, I,X(I),Y(I),Z(I),PHI(I),THETA(I),PSI(I)
ISN 0083          PRINT 800, XDOT(I),YDOT(I),ZDOT(I),PHIDOT(I),THEDOT(I),PSIDOT(I)
ISN 0084          PRINT 800, U(I),V(I),W(I),P(I),Q(I),R(I)
ISN 0085          PRINT 800, UDOT(I),VDOT(I),WDOT(I),PDOT(I),QDOT(I),RDOT(I)
ISN 0086          IF(FCUT.EQ.0.) GO TO 1000
ISN 0088          PRINT 800,XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I)
ISN 0089          GO TO 1010
ISN 0090     1000 PRINT 800, XACC(I),YACC(I),ZACC(I)
ISN 0091          GO TO 1010
ISN 0092      788 IF(FCUT.EQ.0.) GO TO 1001
ISN 0094          PRINT 700,I,XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I)
ISN 0095          GO TO 1010
ISN 0096     1001 PRINT 700,I, XACC(I),YACC(I),ZACC(I)
ISN 0097     1010 PRINT 800
             C
             C    WRITE MASS POINT DATA ON UNIT 1 FOR SUBSEQUENT USE IN PREPLT
             C
ISN 0098          IF(NMEP .EQ. 0) GO TO 7000
ISN 0100          DO 7020 IA=1, NMEP
ISN 0101          IF(I .NE. JMASS(IA,1)) GO TO 7020
ISN 0103          WRITE(1) TIME,I,X(I),Y(I),Z(I),XDOT(I),YDOT(I),ZDOT(I),U(I),V(I),
                 *         W(I),XACC(I),YACC(I),ZACC(I),XACF(I),YACF(I),ZACF(I),
                 *         PHI(I),THETA(I),PSI(I),P(I),Q(I),R(I),PDOT(I),QDOT(I),
                 *          RDOT(I),XIMP(I),YIMP(I),ZIMP(I)
ISN 0104          IF(NPRINT .EQ. 0) NMEW = NMEW + 1
ISN 0106          GO TO 7000
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ISN 0107      7020 CONTINUE
ISN 0108      7000 CONTINUE
             C
             C        PRINT NODE POINT DATA IF THERE IS ANY.
             C
ISN 0109              IF(NNP.EQ.0) GO TO 3099
ISN 0111              DO 4000 JJ=1,NNP
ISN 0112              IF(I.NE.INP(JJ)) GO TO 4000
ISN 0114              IF(NRP .LE. 0) GO TO 2000
ISN 0116              NPR = NPR+5
ISN 0117              PRINT 701,MNP(JJ),XNP(JJ),YNP(JJ),ZNP(JJ)
ISN 0118              PRINT 800,XDNP(JJ),YDNP(JJ),ZDNP(JJ)
ISN 0119              PRINT 800,UNP(JJ),VNP(JJ),WNP(JJ)
ISN 0120              IF(FCUT.EQ.0.) GO TO 1020
ISN 0122              PRINT 800,XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ),
                    1 XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ)
ISN 0123              GO TO 1030
ISN 0124      1020 PRINT 800,XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ)
ISN 0125              GO TO 1030
ISN 0126      2000 NPR = NPR + 2
ISN 0127              IF(FCUT .EQ. 0.0) GO TO 2001
ISN 0129              PRINT 701,MNP(JJ),XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ),
                    1 XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ)
ISN 0130              GO TO 1030
ISN 0131      2001 PRINT 701,MNP(JJ),XACCNP(JJ),YACCNP(JJ),ZACCNP(JJ)
ISN 0132      1030 PRINT 800
             C
             C        WRITE NODE POINT DATA ON UNIT 2 FOR SUBSEQUENT USE IN PREPLT
             C
ISN 0133              IF(NNEP .EQ. 0) GO TO 7001
ISN 0135              IMNP = MNP(JJ)
ISN 0136              DO 7030 IA=1, NNEP
ISN 0137              IF(I .NE. JNODE(IA,2) .OR. IMNP .NE. JNODE(IA,1)) GO TO 7030
ISN 0139              WRITE(2) TIME,I,IMNP,XNP(JJ),YNP(JJ),ZNP(JJ),XDNP(JJ),
                    *          YDNP(JJ),ZDNP(JJ),UNP(JJ),VNP(JJ),WNP(JJ),XACCNP(JJ),
                    *           YACCNP(JJ),ZACCNP(JJ),XACNPF(JJ),YACNPF(JJ),ZACNPF(JJ),
                    *           XIMPNP(JJ),YIMPNP(JJ),ZIMPNP(JJ)
ISN 0140              IF(NPRINT .EQ. 0) NNEW = NNEW + 1
ISN 0142              GO TO 7001
ISN 0143      7030 CONTINUE
ISN 0144      7001 CONTINUE
ISN 0145      4000 CONTINUE
ISN 0146       701 FORMAT(4X,'NODE',I2,1P6E15.5)
ISN 0147       700 FORMAT(1H ,5HMASS ,I2,2X,1P6E15.5)
ISN 0148       800 FORMAT(1H ,9X,1P6E15.5)
ISN 0149      3099 CONTINUE
ISN 0150              IF(NIMP.GT.0) PRINT 3215
ISN 0152              IF(NIMP.LE.0) PRINT 3216
ISN 0154      3215 FORMAT(1X,'MASS IMPULSES(G-SEC)-BASED ON FILTERED ACCELS'//
                    1 16X,8HXIMPULSE,7X,8HYIMPULSE,7X,8HZIMPULSE/)
ISN 0155      3216 FORMAT (//1X,'NO MASS IMPULSE DATA REQUESTED'/)
ISN 0156              IF(NIMP.LE.0) GO TO 3098
ISN 0158              DO 3097 I=1,NM
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ISN 0159          PRINT 700,I,XIMP(I),YIMP(I),ZIMP(I)
ISN 0160          IF(NNP.EQ.0) GO TO 3096
ISN 0162          DO 3096 JJ=1,NNP
ISN 0163          IF(I.NE.INP(JJ)) GO TO 3096
ISN 0165          NPR=NPR+2
ISN 0166          PRINT 701,MNP(JJ),XIMPNP(JJ),YIMPNP(JJ),ZIMPNP(JJ)
ISN 0167     3096 CONTINUE
ISN 0168     3097 CONTINUE
ISN 0169     3098 CONTINUE
ISN 0170          PRINT 3202
ISN 0171     3202 FORMAT(1X,'BEAM FORCES' /)
            C     NSF=OR< 0 NO STRAIN FORCE PRINT
ISN 0172          IF(NSF-0) 3208,3208,3223
ISN 0173     3223 PRINT 3203
ISN 0174     3203 FORMAT(1X,'STRAIN FORCES' /)
ISN 0175          PRINT 830
ISN 0176      830 FORMAT(4X,'I',3X,'J',3X,'M',3X,'N',7X,'FX',11X,'FY',11X,'FZ',11X,
                 1       'MX',11X,'MYI',10X,'MYJ',10X,'MZI',10X,'MZJ')
ISN 0177          PRINT 810,(IG(IJ),JG(IJ),MG(IJ),NG(IJ),(SUMDF(K,IJ),K=1,4),
                 1  SUMDFI(5,IJ),SUMDF(5,IJ),SUMDFI(6,IJ),SUMDF(6,IJ),IJ=1,NB)
            C     NTF=OR<0 NO TOTAL FORCE PRINT
ISN 0178          GO TO 3250
ISN 0179     3208 PRINT 850
ISN 0180      850 FORMAT(/ 1X,'NO STRAIN FORCE PRINT')
ISN 0181     3250 IF(NTF-0)3209,3209,3224
ISN 0182     3224 PRINT 3204
ISN 0183     3204 FORMAT(/ 1X,'TOTAL FORCES (STRAIN+DAMPING)' /)
ISN 0184          PRINT 830
ISN 0185          PRINT 810,(IG(IJ),JG(IJ),MG(IJ),NG(IJ),(FINT(K,IJ),K=1,4),
                 1  FINTI(5,IJ),FINT(5,IJ),FINTI(6,IJ),FINT(6,IJ),IJ=1,NB)
ISN 0186          GO TO 3251
ISN 0187     3209 PRINT 851
ISN 0188      851 FORMAT(/ 1X,'NO TOTAL FORCE PRINT')
ISN 0189     3251 CONTINUE
            C
            C     WRITE BEAM FORCE DATA ON UNIT 3 FOR SUBSEQUENT USE IN PREPLT
            C
ISN 0190          IF(NBFP .EQ. 0) GO TO 7002
ISN 0192          DO 7006 IJ=1, NB
ISN 0193          DO 7040 IA=1, NBFP
ISN 0194          IF(IJ .NE. JBMF(IA,1)) GO TO 7040
ISN 0196          IIG = IG(IJ)
ISN 0197          IJG = JG(IJ)
ISN 0198          IMG = MG(IJ)
ISN 0199          ING = NG(IJ)
ISN 0200          WRITE(3) TIME,IJ,IIG,IJG,IMG,ING,(FINT(K,IJ),K=1,4),FINTI(5,IJ),
                 *        FINT(5,IJ),FINTI(6,IJ),FINT(6,IJ)
ISN 0201          IF(NPRINT .EQ. 0) NBFW = NBFW + 1
ISN 0203          GO TO 7006
ISN 0204     7040 CONTINUE
ISN 0205     7006 CONTINUE
ISN 0206     7002 CONTINUE
ISN 0207          IF(NDE - 0) 3210,3210,3225
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                 C      NDE=OR<0 NO DEFL.PRINT                                   00002530
ISN 0208          3225 PRINT 3205                                                00002540
ISN 0209          3205 FORMAT(// 1X,'BEAM RELATIVE DEFLECTIONS AND ROTATIONS AND',  00002550
                     1              ' BEAM EULER ANGLES (INCHES AND DEGREES)')   00002560
ISN 0210               PRINT 3301                                                00002570
ISN 0211          3301 FORMAT(/ 5X,'BEAM',16X,'DEFLECTIONS (J-I)',23X,'ROTATIONS (J-I)', 00002580
                     1       18X,'ROTATIONS (J+I)',7X,'EULER ANGLES')            00002590
ISN 0212               PRINT 3302                                                00002600
ISN 0213          3302 FORMAT(/ 3X,'I',2X,'J',2X,'M',2X,'N',7X,'X',12X,'Y',12X,'Z', 00002610
                     1       11X,'PHI',9X,'THETA',9X,'PSI',9X,'THETA',9X,'PSI',7X, 00002620
                     2       'THETA',3X,'PSI')                                   00002630
ISN 0214               DO 3303 IJ=1,NB                                           00002640
ISN 0215               RADEG = 180./3.1415926535                                 00002650
ISN 0216               DO 3304 K=1,3                                             00002660
ISN 0217               TEMP(K) = RADEG*VEE2(K+3,IJ)                              00002670
ISN 0218               IF(K.GT.2) GO TO 3304                                     00002680
ISN 0220               TEMP(K+3) = RADEG*VEEN(K,IJ)                              00002690
ISN 0221          3304 CONTINUE                                                  00002700
ISN 0222               TEMP(6) = RADEG*THEIJ(IJ)                                 00002710
ISN 0223               TEMP(7) = RADEG*PSIIJ(IJ)                                 00002720
ISN 0224               PRINT 3305,IG(IJ),JG(IJ),MG(IJ),NG(IJ),(VEE2(K,IJ),K=1,3), 00002730
                     1           (TEMP(K),K=1,7)                                 00002740
ISN 0225          3305 FORMAT(1X,4I3,1P8E13.4,1X,0P2F7.1)                        00002750
ISN 0226          3303 CONTINUE                                                  00002760
ISN 0227           810 FORMAT (1X,4I4,1P8E13.4)                                  00002770
ISN 0228               GO TO 3252                                                00002780
ISN 0229          3210 PRINT 852                                                 00002790
ISN 0230           852 FORMAT(/ 1X,'NO BEAM DEFL.PRINT')                         00002800
ISN 0231          3252 CONTINUE                                                  00002810
                 C                                                               00002820
                 C      WRITE BEAM DEFLECTION DATA ON UNIT 4 FOR SUBSEQUENT USE IN PREPLT 00002830
                 C                                                               00002840
ISN 0232               IF(NBDP .EQ. 0) GO TO 7003                                00002850
ISN 0234               RADEG = 180.0 / 3.1415926535                              00002860
ISN 0235               DO 7008 IJ=1, NB                                          00002870
ISN 0236               DO 7050 IA=1, NBDP                                        00002880
ISN 0237               IF(IJ .NE. JBMD(IA,1)) GO TO 7050                         00002890
ISN 0239               DO 7010 K=1, 3                                            00002900
ISN 0240               TEMP(K) = RADEG * VEE2(K+3,IJ)                            00002910
ISN 0241               IF(K .GT. 2) GO TO 7010                                   00002920
ISN 0243               TEMP(K+3) = RADEG * VEEN(K,IJ)                            00002930
ISN 0244          7010 CONTINUE                                                  00002940
ISN 0245               TEMP(6) = RADEG * THEIJ(IJ)                               00002950
ISN 0246               TEMP(7) = RADEG * PSIIJ(IJ)                               00002960
ISN 0247               IIG = IG(IJ)                                              00002970
ISN 0248               IJG = JG(IJ)                                              00002980
ISN 0249               IMG = MG(IJ)                                              00002990
ISN 0250               ING = NG(IJ)                                              00003000
ISN 0251               WRITE(4) TIME,IJ,IIG,IJG,IMG,ING,(VEE2(K,IJ),K=1,3),      00003010
                     *           (TEMP(K),K=1,5)                                 00003020
ISN 0252               IF(NPRINT .EQ. 0) NBDW = NBDW + 1                         00003030
ISN 0254               GO TO 7008                                                00003040
ISN 0255          7050 CONTINUE                                                  00003050
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ISN 0256      7008 CONTINUE                                                        00003060
ISN 0257      7003 CONTINUE                                                        00003070
ISN 0258           IF(NSPD - 0) 3211,3211,3226                                     00003080
            C      NSPD=OR<0 NO EXT.SPRING PRINT                                   00003090
ISN 0259      3226 PRINT 3206                                                      00003100
ISN 0260      3206 FORMAT(// 1X,'EXTERNAL SPRINGS' /                               00003110
                 1 57X,'GROUND CONTACT POINT LOADS',13X,'GROUND CONTACT POINT LOADS'00003120
                 2  / 59X,'IN GROUND OR SLOPE AXES',21X,'IN MASS AXES' /           00003130
                 3 41X,'SPRING' / 1X,'MASS SPRING  SPRING',8X,'GROUND',4X,         00003140
                 4 'COMPRESSION',2X,'X(+ AFT OR',4X,'Y(+ LEFT) Z(+ UP OR NOR-',6X, 00003150
                 5 'X',13X,'Y',12X,'Z' / 3X,'I  K  M  COMPRESSION',3X,             00003160
                 6 'DEFLECTION',5X,                                                00003170
                 7 'LOAD',6X,'DOWN SLOPE)',13X,'MAL TO SLOPE)',2X,'(+ FORWARD)',   00003180
                 8 3X,'(+ RIGHT)',5X,'(+ DOWN)' /)                                 00003190
ISN 0261           GO TO 3228                                                      00003200
ISN 0262      3211 PRINT 853                                                       00003210
ISN 0263       853 FORMAT(/ 1X,'NO EXTERNAL SPRING PRINT')                         00003220
ISN 0264           GO TO 3227                                                      00003230
ISN 0265      3228 DO 3040 IKM=1,NSP                                               00003240
ISN 0266           SCNET = SC(IKM)-DELG(IKM)                                       00003250
ISN 0267           PRINT 820,II(IKM),KK(IKM),MM(IKM),SCNET,DELG(IKM),              00003260
                 1 (FSPRNG(IKM,J),J=1,7)                                           00003270
ISN 0268       820 FORMAT(1X,3I3,1P9E13.5)                                         00003280
ISN 0269      3040 CONTINUE                                                        00003290
ISN 0270      3227 CONTINUE                                                        00003300
            C                                                                      00003310
            C      WRITE EXTERNAL SPRING DATA ON UNIT 8 FOR SUBSEQUENT USE IN PREPLT 00003320
            C                                                                      00003330
ISN 0271           IF(NSEP .EQ. 0) GO TO 7004                                      00003340
ISN 0273           DO 7060 IA=1, NSEP                                              00003350
ISN 0274           DO 7009 IKM=1, NSP                                              00003360
ISN 0275           IF(II(IKM) .NE. JSPR(IA,1) .OR. MM(IKM) .NE. JSPR(IA,2))        00003370
                 *    GO TO 7009                                                   00003380
ISN 0277           III = II(IKM)                                                   00003390
ISN 0278           IKK = KK(IKM)                                                   00003400
ISN 0279           IMM = MM(IKM)                                                   00003410
ISN 0280           WRITE(8) TIME,III,IKK,IMM,SC(IKM),FSPRNG(IKM,1)                 00003420
ISN 0281           IF(NPRINT .EQ. 0) NSEW = NSEW + 1                               00003430
ISN 0283      7009 CONTINUE                                                        00003440
ISN 0284      7060 CONTINUE                                                        00003450
ISN 0285      7004 CONTINUE                                                        00003460
ISN 0286           IF(NDRI .EQ. 0) GO TO 3076                                      00003470
ISN 0288           PRINT 3207                                                      00003480
ISN 0289      3207 FORMAT(/ 1X,'DRI RESULTS: MASS NO. AND DRI VALUE')              00003490
ISN 0290           PRINT 821                                                       00003500
ISN 0291       821 FORMAT(1H //1X,'MASS',7X,'DRI')                                 00003510
ISN 0292           DO 3070 I = 1,NB                                                00003520
ISN 0293           IF(IJPR(I).EQ.0) GO TO 3070                                     00003530
ISN 0295      3065 PRINT 822, JG(I),DRI(I)                                         00003540
            C                                                                      00003550
            C      WRITE BEAM DRI DATA ON UNIT 9 FOR SUBSEQUENT USE IN PREPLT      00003560
            C                                                                      00003570
ISN 0296           IF(NDRP .EQ. 0) GO TO 7005                                      00003580
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ISN 0298          IJG = JG(I)
ISN 0299          DO 7070 IA=1, NDRP
ISN 0300          IF(IJG .NE. JDRI(IA)) GO TO 7070
ISN 0302          WRITE(9) TIME,IJG,DRI(I)
ISN 0303          IF(NPRINT .EQ. 0) NDRW = NDRW + 1
ISN 0305          GO TO 7005
ISN 0306     7070 CONTINUE
ISN 0307     7005 CONTINUE
ISN 0308     3070 CONTINUE
ISN 0309     3076 PRINT 3075,XDOTAP,YDOTAP,ZDOTAP
ISN 0310     3075 FORMAT(/ 1X,'VEHICLE C.G. TRANSLATIONAL VELOCITIES, GROUND AXES, B
                 1ASED ON SYSTEM LINEAR MOMENTUM' // 11X,'XDOT',10X,'YDOT',12X,'ZDOT
                 2' / 10X,'(+FWD)',7X,'(+RIGHT)',8X,'(+DOWN)' / 4X,1P3E15.5)
                C
                C     WRITE VEHICLE C.G. VELOCITY DATA ON UNIT 10 FOR SUBSEQUENT USE IN
                C     PREPLT
                C
ISN 0311          WRITE(10) TIME,XDOTAP,YDOTAP,ZDOTAP
                C
ISN 0312          IF(NVCH .LE. 0) GO TO 3074
ISN 0314          PRINT 3071
ISN 0315     3071 FORMAT(// 1X,'VOLUME CHANGE DATA' // 48X,'VOLUME LENGTH CHANGES'
                 1/ 1X,'VOL. NO.',5X,'VOL.',8X,'VOL./VZERO',8X,'DX',13X,'DY',13X,
                 2'DZ' /)
ISN 0316          DO 3073 I=1,NVCH
ISN 0317          VOV = VOL(I)/VZERO(I)
ISN 0318          PRINT 3072,I,VOL(I),VOV,(DLVOL(I,J),J=1,3)
ISN 0319     3073 CONTINUE
ISN 0320     3072 FORMAT(1X,I6,1P5E15.5)
ISN 0321      822 FORMAT(1H ,1X,I2,3X,1PE15.5)
ISN 0322     3074 SUMKEI = 0.0
ISN 0323          SUMPEI = 0.0
ISN 0324          SUMSEI = 0.0
ISN 0325          SUMDEI = 0.0
ISN 0326          SUMCEI = 0.0
ISN 0327          SUMFEI = 0.
ISN 0328          DO 3400 I = 1,NM
ISN 0329          SUMPEI = SUMPEI+PEI(I)
ISN 0330          SUMKEI = SUMKEI+KEI(I)
ISN 0331     3400 CONTINUE
ISN 0332          DO 3406 IJ = 1,NB
ISN 0333          SUMSEI = SUMSEI+SEIJ(IJ)
ISN 0334     3406 SUMDEI = SUMDEI+DEIJ(IJ)
                C     WRITE BEAM STRAIN&DAMPING ENERGY DATA ON UNIT 11 FOR USE IN PREPLT
ISN 0335          DO 7200 IJ=1,NB
ISN 0336          IF(TIME.EQ.0.) GO TO 9003
ISN 0338          PCSE=(SEIJ(IJ)/SUMSEI)*100.
ISN 0339          PCDE=(DEIJ(IJ)/SUMDEI)*100.
ISN 0340          GO TO 9004
ISN 0341     9003 SEIJ(IJ)=0.
ISN 0342          DEIJ(IJ)=0.
ISN 0343          PCSE=0.
ISN 0344          PCDE=0.
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ISN 0345      9004 DO 7201 IA=1,NENP
ISN 0346           IF(IJ.NE.JENG(IA,1)) GO TO 7201
ISN 0348           IIG=IG(IJ)
ISN 0349           IJG=JG(IJ)
ISN 0350           IMG=MG(IJ)
ISN 0351           ING=NG(IJ)
ISN 0352           WRITE(11) TIME,IJ,IIG,IMG,IJG,ING,SEIJ(IJ),PCSE,DEIJ(IJ),PCDE
ISN 0353           IF(NPRINT.EQ.0) NENW=NENW+1
ISN 0355           GO TO 7200
ISN 0356      7201 CONTINUE
ISN 0357      7200 CONTINUE
ISN 0358           IF(NSP.EQ.0) GO TO 3409
ISN 0360           DO 3407 IKM=1,NSP
ISN 0361           SUMFEI = SUMFEI+CEIKF(IKM)
ISN 0362      3407 SUMCEI = SUMCEI+CEIK(IKM)
ISN 0363      3409 ETOT = SUMKEI+SUMPEI+SUMSEI+SUMDEI+SUMCEI+SUMFEI
ISN 0364           IF(TIME.EQ.0.0) ETOTTO = ETOT
ISN 0366           ETOTR=ETOT/ETOTTO
ISN 0367           XTOL1=NTOL1/100.
ISN 0368           IF((DABS(ETOTR)-1.).LE. XTOL1) GO TO 3770
ISN 0370           IEER=1
ISN 0371           IETOT=1
ISN 0372      3770 IF(INGSCT.EQ.200) GO TO 3414
ISN 0374           INGSCT = INGSCT+1
ISN 0375           ETIME(INGSCT) = TIME
ISN 0376           DEV(INGSCT)   = DEVMAX
ISN 0377           ENGSMY(1,INGSCT) = SUMKEI
ISN 0378           ENGSMY(2,INGSCT) = SUMPEI
ISN 0379           ENGSMY(3,INGSCT) = SUMSEI
ISN 0380           ENGSMY(4,INGSCT) = SUMDEI
ISN 0381           ENGSMY(5,INGSCT) = SUMCEI
ISN 0382           ENGSMY(6,INGSCT) = SUMFEI
ISN 0383      3414 CONTINUE
ISN 0384           PRINT 3405
ISN 0385      3405 FORMAT(// 1X,'ENERGY DISTRIBUTION' //)
ISN 0386           PRINT 3401
ISN 0387      3401 FORMAT(1H0,6X,'TOTAL',7X,'KINETIC',6X,'POTENTIAL',7X,'STRAIN',7X,
                 1 'DAMPING',7X,'CRUSHING',6X,'FRICTION' / 6X,'ENERGY',
                 2 6(8X,'ENERGY') /)
ISN 0388           PRINT 3402, ETOT,SUMKEI,SUMPEI,SUMSEI,SUMDEI,SUMCEI,SUMFEI
ISN 0389      3402 FORMAT(1X,1P7E14.5)
ISN 0390           PCKE = SUMKEI/ETOT
ISN 0391           PCPE = SUMPEI/ETOT
ISN 0392           PCSE = SUMSEI/ETOT
ISN 0393           PCDE = SUMDEI/ETOT
ISN 0394           PCCE = SUMCEI/ETOT
ISN 0395           PCFE = SUMFEI/ETOT
ISN 0396           PRINT 3403, PCKE,PCPE,PCSE,PCDE,PCCE,PCFE
ISN 0397      3403 FORMAT('0  PERCENT OF',2P6F14.3/3X,'TOTAL ENERGY')
ISN 0398           IF(NED-0) 3601,3601,3229
              C    NED=<0. NO INDIVIDUAL ENERGY TERMS PRINTED
ISN 0399      3229 PRINT 3404
ISN 0400      3404 FORMAT(// 43X,'INTERNAL',38X,'EXTERNAL' /
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                 1 45X,'BEAM',41X,'SPRING' / 7X,'KINETIC',9X,
                 2 'POTENTIAL',25X,'STRAIN',11X,'DAMPING',17X,'CRUSHING',9X,
                 3 'FRICTION' / 1X,'MASS',2X,'ENERGY',5X,'PCT',3X,'ENERGY',5X,
                 4 'PCT',2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',3X,'ENERGY',5X,'PCT',
                 5 3X,'ENERGY',5X,'PCT',3X,'I',1X,'K',1X,'M',3X,'ENERGY',5X,'PCT',
                 6 3X,'ENERGY',5X,'PCT' /)
ISN 0401   3601 XTOL2=NTOL2/100.
ISN 0402        XTOL3=NTOL3
ISN 0403        MAXEN = MAX0(NM,NB,NSP)
ISN 0404        IF(TIME.EQ.0.0) MAXEN = NM
ISN 0406        DO 3410 IO = 1,MAXEN
ISN 0407        IOPTR = 0
ISN 0408        IF(IO.GT.NM) GO TO 3411
ISN 0410        IOPTR = IOPTR+4
ISN 0411        IF(SUMKEI.NE.0.) GO TO 5000
ISN 0413        PCKE = 0.
ISN 0414        GO TO 5001
ISN 0415   5000 PCKE = KEI(IO)/SUMKEI
ISN 0416   5001 IF(SUMPEI.NE.0.) GO TO 5002
ISN 0418        PCPE = 0.
ISN 0419        GO TO 5003
ISN 0420   5002 PCPE = PEI(IO)/SUMPEI
ISN 0421   5003 IF(TIME.EQ.0.0) GO TO 3504
ISN 0423   3411 IF(IO.GT.NB)  GO TO 3412
ISN 0425        IOPTR = IOPTR+2
ISN 0426        IF (SUMSEI .EQ. 0) GO TO 3415
ISN 0428        PCSE = SEIJ(IO)/SUMSEI
ISN 0429        IF(SUMSEI.GE.0.) GO TO 3700
ISN 0431        IESE=1
ISN 0432        IEER=1
ISN 0433   3700 IF(SEIJ(IO).GE.0. .OR. DABS(SEIJ(IO)).LE.DABS(SUMSEI*XTOL2))
               1 GO TO 3710
ISN 0435        IEPSE=1
ISN 0436        IEER=1
ISN 0437   3710 GO TO 3416
ISN 0438   3415 PCSE = 0.
ISN 0439   3416 IF (SUMDEI .EQ. 0.) GO TO 3417
ISN 0441        PCDE = DEIJ(IO)/SUMDEI
ISN 0442        IF(SUMDEI.GE.0.) GO TO 3720
ISN 0444        IEDE=1
ISN 0445        IEER=1
ISN 0446   3720 IF(DEIJ(IO).GE.0. .OR.DABS(DEIJ(IO)).LE.DABS(SUMDEI*XTOL2))
               1 GO TO 3730
ISN 0448        IEPDE=1
ISN 0449        IEER=1
ISN 0450   3730 GO TO 3412
ISN 0451   3417 PCDE = 0.
ISN 0452   3412 IF(IO.GT.NSP) GO TO 3418
ISN 0454        IOPTR = IOPTR+1
ISN 0455        I = II(IO)
ISN 0456        K = KK(IO)
ISN 0457        M = MM(IO)
ISN 0458        CE = CEIK(IO)
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ISN 0459          IF(SUMCEI.NE.0.) GC TO 5010
ISN 0461          PCCE = 0.
ISN 0462          GO TO 5011
ISN 0463     5010 FCCE = CE/SUMCEI
ISN 0464          IF(SUMCEI.GE.0.) GO TO 3740
ISN 0466          IECE=1
ISN 0467          IEER=1
ISN 0468     3740 IF(CEIKF(IO).GE.0. .OR. DABS(CEIKF(IO)).LE.DABS(SUMCEI*XTOL2))
                 1 GO TO 5011
ISN 0470          IEPCE=1
ISN 0471          IEER=1
ISN 0472     5011 FE = CEIKF(IO)
ISN 0473          IF(SUMFEI.NE.0.) GO TO 5012
ISN 0475          PCFE = 0.
ISN 0476          GO TO 3418
ISN 0477     5012 PCFE = FE/SUMFEI
ISN 0478          IF(SUMFEI.GE.0.) GO TO 3750
ISN 0480          IEFE=1
ISN 0481          IEER=1
ISN 0482     3750 IF(CEIKF(IO).GE.0. .OR.DABS(CEIKF(IO)).LE.DABS(SUMFEI*XTOL2))
                 1 GO TO 3418
ISN 0484          IEPFE=1
ISN 0485          IEER=1
ISN 0486     3418 IF(NED-0) 3410,3410,3413
ISN 0487     3413 GO TO (3501,3502,3503,3504,3505,3506,3507), IOPTR
            C*****ONLY CE
ISN 0488     3501 PRINT 3511,I,K,M,CE,PCCE,FE,PCFE
ISN 0489     3511 FORMAT(88X,I4,2I2,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0490          GO TO 3410
            C*****SE AND DE
ISN 0491     3502 PRINT 3512,IO,IG(IO),JG(IO),MG(IO),NG(IO),SEIJ(IO),PCSE,DEIJ(IO),
                 1 PCDE
ISN 0492     3512 FORMAT(39X,5I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0493          GO TO 3410
            C*****SE, DE, CE
ISN 0494     3503 PRINT 3513,IO,IG(IO),JG(IO),MG(IO),NG(IO),
                 1 SEIJ(IO),PCSE,DEIJ(IO),PCDE,I,K,M,CE,
                 2 PCCE,FE,PCFE
ISN 0495     3513 FORMAT(39X,5I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,I4,2I2,1PE11.3,
                 1 2PF6.1,1PE11.3,2PF6.1)
ISN 0496          GO TO 3410
            C*****KE AND PE
ISN 0497     3504 PRINT 3514,IO,KEI(IO),PCKE,PEI(IO),PCPE
ISN 0498     3514 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0499          GO TO 3410
            C*****KE, PE, CE
ISN 0500     3505 PRINT 3515,IO,KEI(IO),PCKE,PEI(IO),PCPE,I,K,M,CE,PCCE,FE,PCFE
ISN 0501     3515 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,50X,I4,2I2,
                 1 1PE11.3,2PF6.1,1PE11.3,2PF6.1)
ISN 0502          GO TO 3410
            C*****KE, PE, SE, DE
ISN 0503     3506 PRINT 3516,IO,KEI(IO),PCKE,PEI(IO),PCPE,IO,IG(IO),JG(IO),
                 1 MG(IO),NG(IO),SEIJ(IO),
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                  2 PCSE,DEIJ(IO),PCDE                                             00005710
ISN 0504     3516 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,1X,5I3,                00005720
                  1 1PE11.3,2PF6.1,1PE11.3,2PF6.1)                                 00005730
ISN 0505          GO TO 3410                                                       00005740
            C*****KE, PE, SE, DE, CE                                               00005750
ISN 0506     3507 PRINT 3517,IO,KEI(IO),PCKE,PEI(IO),PCPE,IO,IG(IO),JG(IO),        00005760
                  1 MG(IO),NG(IO),SEIJ(IO),                                        00005770
                  2 PCSE,DEIJ(IO),PCDE,I,K,M,CE,PCCE,FE,PCFE                       00005780
ISN 0507     3517 FORMAT(1X,I3,1PE11.3,2PF6.1,1PE11.3,2PF6.1,1X,5I3,1PE11.3,2PF6.1, 00005790
                  1 1PE11.3,2PF6.1,I4,2I2,1PE11.3,2PF6.1,1PE11.3,2PF6.1)           00005800
ISN 0508     3410 CONTINUE                                                         00005810
ISN 0509          PRINT 8000                                                       00005820
ISN 0510     8000 FORMAT(// 1X,'DEVIATION OF TOTAL ENERGY OF EACH MASS FROM ',     00005830
                  1               '100 PERCENT')                                   00005840
ISN 0511          PRINT 8002                                                       00005850
ISN 0512     8002 FORMAT(// 1X,'MASS',2X,'DEVIATION(PERCENT)' /)                   00005860
ISN 0513          DO 8004 I=1,NM                                                   00005870
ISN 0514          DEVIAT = XPCT(I)-100.                                            00005880
ISN 0515          IF(DABS(DEVIAT).LE.XTOL3) GO TO 3760                             00005890
ISN 0517          IEDEV=1                                                          00005900
ISN 0518          IEER=1                                                           00005910
ISN 0519     3760 IF(XPCT(I).EQ.0) DEVIAT=0.                                       00005920
ISN 0521          PRINT 8006,I,DEVIAT                                              00005930
ISN 0522     8004 CONTINUE                                                         00005940
ISN 0523     8006 FORMAT(1X,I3,4X,F12.6)                                           00005950
ISN 0524          IF(NED-0) 3212,3212,3602                                         00005960
ISN 0525     3602 GO TO 3230                                                       00005970
ISN 0526     3212 PRINT 854                                                        00005980
ISN 0527      854 FORMAT (/ 1X,'NO ENERGY TERMS PRINTED')                          00005990
ISN 0528     3230 IF(NS-0) 3213,3213,3231                                          00006000
            C     NS EQ OR LESS THAN 0   NO STRESSES ARE PRINTED                   00006010
ISN 0529     3231 PRINT 3510                                                       00006020
ISN 0530     3510 FORMAT(// 1X,'ELEMENT STRESSES')                                 00006030
ISN 0531          PRINT 3519                                                       00006040
ISN 0532     3519 FORMAT(// 39X,'RATIO OF CURRENT STRESS / FAILURE STRESS',31X,    00006050
                  1 'RATIO OF CURRENT' / 8X,'BEAM',12X,'MAXIMUM SHEAR STRESS THEORY',00006060
                  * 9X,'THEORY OF CONSTANT ENERGY OF DISTORTION',6X,'AXIAL/FAILURE', 00006070
                  * 5X,'BUCK. /' / 2X,'IJ',2X,'I',2X,'J',2X,'M',2X,'N',5X,'TOP',5X,  00006080
                  * 'BOTTOM',6X,'LEFT',5X,'RIGHT',8X,'TOP',5X,'BOTTOM',6X,'LEFT',5X, 00006090
                  * 'RIGHT',7X,'COMPR.   TENSILE   CR.BUCK.' / 104X,'STRESS   STRESS'00006100
                  * ,6X,'LOAD' /)                                                  00006110
ISN 0533          DO 3520 IJ=1,NB                                                  00006120
ISN 0534          I = IG(IJ)                                                       00006130
ISN 0535          J = JG(IJ)                                                       00006140
ISN 0536          M = MG(IJ)                                                       00006150
ISN 0537          N = NG(IJ)                                                       00006160
ISN 0538          IF(SBUCKR(IJ) .GT. 0.0) GO TO 3521                               00006170
ISN 0540          BLOAD = DABS(SBUCKR(IJ))                                         00006180
ISN 0541          IF(AA(IJ) .EQ. 0.0) GO TO 3525                                   00006190
ISN 0543          SAXL = BLOAD * PCR(IJ) / (AA(IJ) * SCOMP(MC(IJ)))                00006200
ISN 0544          GO TO 3526                                                       00006210
ISN 0545     3525 SAXL = 0.0                                                       00006220
ISN 0546     3526 PRINT 3518, IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),(FRD(IJ,IT),IT=1,4),  00006230
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                    *          SAXL,BLOAD                                           00006240
ISN 0547       3518 FORMAT(1X,5I3,1X,1P4E10.3,2X,4E10.3,2X,E10.3,10X,E10.3)         00006250
ISN 0548            GO TO 3520                                                       00006260
ISN 0549       3521 CONTINUE                                                         00006270
ISN 0550            BLOAD = 0.0                                                      00006280
ISN 0551            IF(AA(IJ) .EQ. 0.0) GO TO 3522                                   00006290
ISN 0553            SAXL = SBUCKR(IJ) * PCR(IJ) / (STENS(MC(IJ)) * AA(IJ))           00006300
ISN 0554            GO TO 3523                                                       00006310
ISN 0555       3522 SBUCK = 0.0                                                      00006320
ISN 0556       3523 PRINT 3524, IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),(FRD(IJ,IT),IT=1,4),  00006330
                    *          SAXL                                                  00006340
ISN 0557       3524 FORMAT(1X,5I3,1X,1P4E10.3,2X,4E10.3,12X,E10.3)                   00006350
ISN 0558       3520 CONTINUE                                                         00006360
ISN 0559            GO TO 3232                                                       00006370
ISN 0560       3213 PRINT 855                                                        00006380
ISN 0561        855 FORMAT(/ 1X,'NO STRESS PRINT')                                   00006390
               C                                                                     00006400
               C    WRITE BEAM ELEMENT STRESS DATA ON UNIT 13 FOR SUBSEQUENT USE IN  00006410
               C    PREPLT                                                           00006420
               C                                                                     00006430
ISN 0562       3232 IF(NSTP .EQ. 0) GO TO 7100                                       00006440
ISN 0564            DO 7110 IJ=1, NB                                                 00006450
ISN 0565            DO 7080 IA=1, NSTP                                               00006460
ISN 0566            IF(IJ .NE. JBMS(IA,1)) GO TO 7080                                00006470
ISN 0568            I = IG(IJ)                                                       00006480
ISN 0569            J = JG(IJ)                                                       00006490
ISN 0570            M = MG(IJ)                                                       00006500
ISN 0571            N = NG(IJ)                                                       00006510
ISN 0572            BLOAD = SBUCKR(IJ)                                               00006520
ISN 0573            IF(BLOAD .GT. 0.0) BLOAD = 0.0                                   00006530
ISN 0575            IF(AA(IJ) .EQ. 0.0) GO TO 3527                                   00006540
ISN 0577            IF(SBUCKR(IJ) .GT. 0.0) GO TO 3528                               00006550
ISN 0579            SAXL = SBUCKR(IJ) * PCR(IJ) / (AA(IJ) * SCOMP(MC(IJ)))           00006560
ISN 0580            GO TO 3529                                                       00006570
ISN 0581       3528 SAXL = SBUCKR(IJ) * PCR(IJ) / (AA(IJ) * STENS(MC(IJ)))           00006580
ISN 0582            GO TO 3529                                                       00006590
ISN 0583       3527 SAXL = 0.0                                                       00006600
ISN 0584       3529 CONTINUE                                                         00006610
ISN 0585            WRITE(13) TIME,IJ,I,J,M,N,(FRS(IJ,IS),IS=1,4),                   00006620
                    *         (FRD(IJ,IT),IT=1,4),SAXL,BLOAD                         00006630
ISN 0586            IF(NPRINT .EQ. 0) NSTW = NSTW + 1                                00006640
ISN 0588            GO TO 7110                                                       00006650
ISN 0589       7080 CONTINUE                                                         00006660
ISN 0590       7110 CONTINUE                                                         00006670
ISN 0591       7100 CONTINUE                                                         00006680
ISN 0592            IF(NPLT.EQ.0) GO TO 100                                          00006690
ISN 0594            IPFCT = IPFCT + 1                                                00006700
ISN 0595            IF(IPFCT .EQ. 0 .OR. IPFCT .EQ. NPFCT) GO TO 170                 00006710
ISN 0597            GO TO 100                                                        00006720
ISN 0598        170 CONTINUE                                                         00006730
ISN 0599            IPFCT = 0                                                        00006740
ISN 0600            DO 110 IP=1,NPLT                                                 00006750
ISN 0601            NJ=NMPTS(IP)                                                     00006760
```

```
ISN 0602          DO 160 IJ=1,NJ                                          00006770
ISN 0603          DO 120 IM=1,NM                                          00006780
ISN 0604          IF(IM .NE. MNUM(IJ,IP)) GO TO 120                       00006790
ISN 0606          J=ITPL(IP)                                              00006800
ISN 0607          GO TO (130,140,150),J                                   00006810
ISN 0608      130 A(IJ)= -X(IM)                                           00006820
ISN 0609          B(IJ)=Y(IM)                                             00006830
ISN 0610          IFIRST = 1                                              00006840
ISN 0611          ILAST = 5                                               00006850
ISN 0612          GO TO 160                                               00006860
ISN 0613      140 A(IJ)= -X(IM)                                           00006870
ISN 0614          B(IJ) = -Z(IM)                                          00006880
ISN 0615          IFIRST = 6                                              00006890
ISN 0616          ILAST = 10                                              00006900
ISN 0617          GO TO 160                                               00006910
ISN 0618      150 A(IJ)=Y(IM)                                             00006920
ISN 0619          B(IJ) = -Z(IM)                                          00006930
ISN 0620          IFIRST = 11                                             00006940
ISN 0621          ILAST = 15                                              00006950
ISN 0622          GO TO 160                                               00006960
ISN 0623      120 CONTINUE                                                00006970
ISN 0624      160 CONTINUE                                                00006980
ISN 0625          PRINT 7120, (IPLN(IJ), IJ=IFIRST, ILAST)                00006990
ISN 0626     7120 FORMAT(1H1,51X,'MASS POSITION PLOT PLANE ** ',5A4 / 20X, 00007000
                *        'NOTE *** A MODIFIED RIGHT HAND GROUND COORDINATE', 00007010
                *        ' SYSTEM HAS BEEN USED FOR THIS PLOT ***' / )     00007020
ISN 0627          PRINT 7130                                              00007030
ISN 0628     7130 FORMAT(4(7X,'MASS    HORIZ    VERTICAL') /              00007040
               1 4(8X,'NO      AXIS       AXIS ') / )                     00007050
ISN 0629          PRINT 7140, (MNUM(IJ,IP),A(IJ),B(IJ),IJ=1,NJ)           00007060
ISN 0630     7140 FORMAT(4(8X,I2,F10.2,F10.2))                            00007070
ISN 0631          PRINT 7150                                              00007080
ISN 0632     7150 FORMAT(1X)                                              00007090
ISN 0633          IF(NJ .LE. 12) GO TO 180                                00007100
ISN 0635          PRINT 7120, IPLN(ITPL(IP))                              00007110
ISN 0636      180 CALL PAPLOT(A,B,XSCALE(IP),YSCALE(IP),MNUM(1,IP),NMPTS(IP), 00007120
                *            ISCALE(IP))                                  00007130
ISN 0637      110 CONTINUE                                                00007140
ISN 0638          PRINT 7160                                              00007150
ISN 0639     7160 FORMAT(1H1,1X)                                          00007160
ISN 0640      100 CONTINUE                                                00007170
ISN 0641          RETURN                                                  00007180
ISN 0642          END                                                     00007190
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*****************************************************************************
*                                                                           *
*                                                                           *
*           LOCKHEED-CALIFORNIA COMPANY, A UNIT OF LOCKHEED CORPORATION.    *
*                                                                           *
*****************************************************************************

     COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
               C        DATA SET D2334RC     AT LEVEL 003 AS OF 06/25/79
               C        DATA SET D2332NRC    AT LEVEL 004 AS OF 12/01/77
               C        DATA SET D2332NRC    AT LEVEL 002 AS OF 11/04/77
               C        DATA SET D2332SRC    AT LEVEL 001 AS OF 07/29/77
ISN 0002                SUBROUTINE RC
               C
ISN 0003                IMPLICIT REAL*8 (A-H,O-Z)
ISN 0004                REAL*8 KUN
ISN 0005                REAL*4 CLTEST
ISN 0006                INTEGER*4 PY(150),PZ(150),PYJ(150),PZJ(150)
ISN 0007                INTEGER*4 TITLE(40)
ISN 0008                INTEGER*2 N1,NN
ISN 0009                INTEGER*2 INBUFF
ISN 0010                INTEGER*2 IJPR,IG,JG
ISN 0011                INTEGER*2 MG(150),NG(150),INP(50),MNP(50)
ISN 0012                DIMENSION AIDP(3,3)
ISN 0013                DIMENSION XK3(6,6,150),YZMIN(150)
ISN 0014                DIMENSION RX(50),RY(50),RZ(50),XNPDP(50),YNPDP(50),ZNPDP(50)
ISN 0015                DIMENSION XNP(50),YNP(50),ZNP(50),XDNP(50),YDNP(50),ZDNP(50)
ISN 0016                DIMENSION UNP(50),VNP(50),WNP(50),XACCNP(50),YACCNP(50),ZACCNP(50)
ISN 0017                DIMENSION IMDRI(80)
ISN 0018                COMMON/DEINPR/ AA(150),E(150),YY(150),ZZ(150),XIQ(150),
                       1 XLB(150),Z1(150),Z2(150),MC(150),XJ(150),SF26(150),SF35(150),
                       2 SF26J(150),SF35J(150),PY,PZ,PYJ,PZJ,NSC,NPIN
ISN 0019                COMMON/CFIC/ SINBET,COSBET,ABETA(9)
ISN 0020                COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
                       1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0021                COMMON/INIC/ XDP(80),ZDP(80),PHIDP(80),PSIDP(80),
                       1 THEDP(80),PPR,QPR,RPR,XGIN,ZGIN,PHIPR,PSIPR,THEPR,
                       2 XGDOT,YGDOT,ZGDOT
ISN 0022                COMMON/INIDCP/ YDP(80)
ISN 0023                COMMON/INCFIC/ BETA
ISN 0024                COMMON/MCFIII/ SYMFLG
ISN 0025                COMMON/NP00I2/ MG,NG,INP,MNP
ISN 0026                COMMON/NP00I4/ NNP
ISN 0027                COMMON/NP00R8/ RX,RY,RZ
ISN 0028                COMMON/NP01R8/ XNP,YNP,ZNP,UNP,VNP,WNP,XDNP,YDNP,ZDNP,
                       1 XACCNP,YACCNP,ZACCNP,SBUCKR(150),PCR(150)
ISN 0029                COMMON/NP02R8/ XNPDP,YNPDP,ZNPDP
ISN 0030                COMMON/DEIC/ WTOT,CLTEST(150)
ISN 0031                COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
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                  1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                  2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                  3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                  4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                  5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                  6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                  7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                  8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                  9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                  A CEIKF(40),
                  B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                  C NM,NB,I,J,IG(150),JG(150),
                  D N1(900),NN(40),IJPR(150)
ISN 0032            COMMON/IPIC/ NIC
ISN 0033            EQUIVALENCE (XK(1),XK3(1,1,1))
ISN 0034            SIN(X) = DSIN(X)
ISN 0035            COS(X) = DCOS(X)
ISN 0036            SQRT(X) = DSQRT(X)
ISN 0037            ARSIN(X) = DARSIN(X)
ISN 0038            ATAN2(Y,X) = DATAN2(Y,X)
ISN 0039            AMIN1(X,Y) = DMIN1(X,Y)
ISN 0040            WTOT = 0.0
ISN 0041            PI = 3.14159265358979324D0
ISN 0042            PI2 = PI/2.
ISN 0043            PIN = -PI
ISN 0044            PI2N = -PI2
ISN 0045            BETAR = BETA*PI/180.
ISN 0046            SINBET = DSIN(BETAR)
ISN 0047            COSBET = DCOS(BETAR)
ISN 0048            ABETA(1) = COSBET
ISN 0049            ABETA(2) = 0.
ISN 0050            ABETA(3) =-SINBET
ISN 0051            ABETA(4) = 0.
ISN 0052            ABETA(5) = 1.
ISN 0053            ABETA(6) = 0.
ISN 0054            ABETA(7) = SINBET
ISN 0055            ABETA(8) = 0.
ISN 0056            ABETA(9) = COSBET
ISN 0057            KMATR(1,1) = 3
ISN 0058            KMATR(1,2) = 4
ISN 0059            KMATR(1,3) = 7
ISN 0060            KMATR(1,4) = 8
ISN 0061            KMATR(2,1) = 1
ISN 0062            KMATR(2,2) = 2
ISN 0063            KMATR(2,3) = 5
ISN 0064            KMATR(2,4) = 6
ISN 0065            KMATR(3,1) = 1
ISN 0066            KMATR(3,2) = 3
ISN 0067            KMATR(3,3) = 5
ISN 0068            KMATR(3,4) = 7
ISN 0069            KMATR(4,1) = 2
ISN 0070            KMATR(4,2) = 4
ISN 0071            KMATR(4,3) = 6
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ISN 0072          KMATR(4,4) = 8                                              00000940
ISN 0073          KMATR(5,1) = 1                                              00000950
ISN 0074          KMATR(5,2) = 2                                              00000960
ISN 0075          KMATR(5,3) = 3                                              00000970
ISN 0076          KMATR(5,4) = 4                                              00000980
ISN 0077          KMATR(6,1) = 5                                              00000990
ISN 0078          KMATR(6,2) = 6                                              00001000
ISN 0079          KMATR(6,3) = 7                                              00001010
ISN 0080          KMATR(6,4) = 8                                              00001020
ISN 0081          PRINT 2001                                                  00001030
ISN 0082     2001 FORMAT(1H1 / 1X,'MODEL PARAMETERS')                         00001040
ISN 0083          DO 2006 I=1,NM                                              00001050
ISN 0084          IMDRI(I) = 0                                                00001060
ISN 0085     2006 CONTINUE                                                    00001070
ISN 0086          DO 2004 IJ=1,NB                                             00001080
ISN 0087          IF(IJPR(IJ).NE.0) IMDRI(JG(IJ))=1                           00001090
ISN 0089     2004 CONTINUE                                                    00001100
ISN 0090          DO 2010 I = 1,NM                                            00001110
ISN 0091          IF(IMDRI(I).NE.0) GO TO 2010                                00001120
ISN 0093          WTOT = WTOT+WGT(I)                                          00001130
            C                                                                 00001140
            C     FOR SYMMETRICAL MODEL,ADD CONTRIBUTIONS FROM OTHER SIDE.    00001150
            C                                                                 00001160
ISN 0094          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2010                  00001170
ISN 0096          WTOT = WTOT+WGT(I)                                          00001180
ISN 0097     2010 CONTINUE                                                    00001190
ISN 0098          PRINT 2011,WTOT                                             00001200
ISN 0099     2011 FORMAT(/ 1X,'VEHICLE WT = ',1PE12.6)                        00001210
ISN 0100          XGDP = 0.0                                                  00001220
ISN 0101          YGDP = 0.0                                                  00001230
ISN 0102          ZGDP = 0.0                                                  00001240
ISN 0103          DO 2020 I = 1,NM                                            00001250
ISN 0104          IF(IMDRI(I).NE.0) GO TO 2020                                00001260
ISN 0106          XGDP = XGDP+WGT(I)*XDP(I)                                   00001270
ISN 0107          YGDP = YGDP+WGT(I)*YDP(I)                                   00001280
ISN 0108          ZGDP = ZGDP+WGT(I)*ZDP(I)                                   00001290
ISN 0109          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2020                  00001300
ISN 0111          XGDP = XGDP+WGT(I)*XDP(I)                                   00001310
ISN 0112          YGDP = YGDP-WGT(I)*YDP(I)                                   00001320
ISN 0113          ZGDP = ZGDP+WGT(I)*ZDP(I)                                   00001330
ISN 0114     2020 CONTINUE                                                    00001340
ISN 0115          XGDP = XGDP/WTOT                                            00001350
ISN 0116          YGDP = YGDP/WTOT                                            00001360
ISN 0117          ZGDP = ZGDP/WTOT                                            00001370
ISN 0118          PRINT 2013                                                  00001380
ISN 0119     2013 FORMAT(/ 1X,'VEHICLE CG POSITION')                          00001390
ISN 0120          PRINT 2012,XGDP,YGDP,ZGDP                                   00001400
ISN 0121     2012 FORMAT(1X,'X (FS) = ',1PE12.5 /                             00001410
                1     1X,'Y (BL) = ',1PE12.5 /                                00001420
                1     1X,'Z (WL) = ',1PE12.5)                                 00001430
            C                                                                 00001440
            C     CALCULATE VECTOR COMPONENTS FROM MASS I TO NODE POINT M     00001450
            C     FOR ALL NNP NODE POINTS.                                    00001460
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            C                                                                      00001470
ISN 0122          IF(NNP.EQ.0) GO TO 2051                                          00001480
ISN 0124          DO 3000 JJ=1,NNP                                                 00001490
ISN 0125          I = INP(JJ)                                                      00001500
ISN 0126          T1 = XDP(I)-XNPDP(JJ)                                            00001510
ISN 0127          T2 = YDP(I)-YNPDP(JJ)                                            00001520
ISN 0128          T3 = ZDP(I)-ZNPDP(JJ)                                            00001530
            C                                                                      00001540
            C  THESE ARE IN (-) AIRPLANE AXES.  CONVERT TO BODY AXES BY            00001550
            C  MULTIPLYING BY AIDP TRANSPOSE.  THIS NORMALLY IS UNITY.             00001560
            C                                                                      00001570
ISN 0129          CALL EULER(AIDP,PHIDP(I),THEDP(I),PSIDP(I))                      00001580
ISN 0130          RX(JJ) = AIDP(1,1)*T1 + AIDP(2,1)*T2 + AIDP(3,1)*T3              00001590
ISN 0131          RY(JJ) = AIDP(1,2)*T1 + AIDP(2,2)*T2 + AIDP(3,2)*T3              00001600
ISN 0132          RZ(JJ) = AIDP(1,3)*T1 + AIDP(2,3)*T2 + AIDP(3,3)*T3              00001610
ISN 0133     3000 CONTINUE                                                         00001620
ISN 0134     2051 CONTINUE                                                         00001630
ISN 0135          PRINT 2014                                                       00001640
ISN 0136     2014 FORMAT(/ 1X,'VEHICLE INERTIAS (IN-LB-SEC**2)')                   00001650
ISN 0137          XIG = 0                                                          00001660
ISN 0138          YIG = 0                                                          00001670
ISN 0139          ZIG = 0                                                          00001680
ISN 0140          DO 2015 I=1,NM                                                   00001690
ISN 0141          IF(IMDRI(I).NE.0) GO TO 2015                                     00001700
ISN 0143          XARM = XDP(I) - XGDP                                             00001710
ISN 0144          YARM = YDP(I) - YGDP                                             00001720
ISN 0145          ZARM = ZDP(I) - ZGDP                                             00001730
ISN 0146          GOODY1 = WGT(I)*(YARM*YARM+ZARM*ZARM)/386.                       00001740
ISN 0147          GOODY2 = WGT(I)*(XARM*XARM+ZARM*ZARM)/386.                       00001750
ISN 0148          GOODY3 = WGT(I)*(XARM*XARM+YARM*YARM)/386.                       00001760
ISN 0149          XIG = XIG+XI(I)+GOODY1                                           00001770
ISN 0150          YIG = YIG+YI(I)+GOODY2                                           00001780
ISN 0151          ZIG = ZIG+ZI(I)+GOODY3                                           00001790
ISN 0152          IF(SYMFLG.NE.1.OR.YDP(I).EQ.0.) GO TO 2015                       00001800
ISN 0154          XIG = XIG+XI(I)+GOODY1                                           00001810
ISN 0155          YIG = YIG+YI(I)+GOODY2                                           00001820
ISN 0156          ZIG = ZIG+ZI(I)+GOODY3                                           00001830
ISN 0157     2015 CONTINUE                                                         00001840
ISN 0158          PRINT 2016,XIG,YIG,ZIG                                           00001850
ISN 0159     2016 FORMAT(1X,'I(XX) = ',1PE11.5 / 1X,'I(YY) = ',1PE11.5 / 1X,       00001860
                 1'I(ZZ) = ',1PE11.5)                                              00001870
ISN 0160          DO 2022 IJ=1,NB                                                  00001880
ISN 0161          I = IG(IJ)                                                       00001890
ISN 0162          J = JG(IJ)                                                       00001900
ISN 0163          M = MG(IJ)                                                       00001910
ISN 0164          N = NG(IJ)                                                       00001920
ISN 0165          IF(M.EQ.0) GO TO 5020                                            00001930
ISN 0167          DO 5010 JI=1,NNP                                                 00001940
ISN 0168          IF(I.EQ.INP(JI).AND.M.EQ.MNP(JI)) GO TO 5020                     00001950
ISN 0170     5010 CONTINUE                                                         00001960
ISN 0171     5020 IF(N.EQ.0) GO TO 5030                                            00001970
ISN 0173          DO 5040 JJ=1,NNP                                                 00001980
ISN 0174          IF(J.EQ.INP(JJ).AND.N.EQ.MNP(JJ)) GO TO 5030                     00001990
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ISN 0176      5040 CONTINUE
              C
              C     THE FOLLOWING CODE GETS CLTEST(IJ),WHICH IS 1 IF BEAM IJ
              C     LIES ENTIRELY IN THE CENTER PLANE OF THE AIRPLANE.THIS
              C     IS USED IN DERIV FOR A NUMBER OF TESTS.
              C
ISN 0177      5030 CLTEST(IJ) = 0.
ISN 0178           IF(SYMFLG.NE.1.) GO TO 2022
ISN 0180           IF(YDP(I).NE.0.OR.YDP(J).NE.0.) GO TO 2022
              C
              C  BOTH MASSES ON CENTERLINE.
              C
ISN 0182           IF(M.EQ.0.AND.N.EQ.0) GO TO 5000
ISN 0184           IF(M.EQ.0) GO TO 5001
ISN 0186           IF(N.EQ.0) GO TO 5002
ISN 0188           IF(YNPDP(JI).EQ.0.AND.YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0190           GO TO 2022
ISN 0191      5001 IF(YNPDP(JJ).EQ.0.) GO TO 5000
ISN 0193           GO TO 2022
ISN 0194      5002 IF(YNPDP(JI).EQ.0.) GO TO 5000
ISN 0196           GO TO 2022
ISN 0197      5000 CLTEST(IJ) = 1.
ISN 0198      2022 CONTINUE
ISN 0199           IF (NIC.LE. 0)  RETURN
              C
              C     COMPUTE PREL. UNCOUPLED LOADS AND DEFLECTIONS
              C
ISN 0201           PRINT 5011
ISN 0202      5011 FORMAT(// 1X,'BEAM LOADS')
ISN 0203           PRINT 5012
ISN 0204      5012 FORMAT(// 6X,'BEAM',19X,'AXIAL LOAD',19X,'SHEAR FORCE',22X,
                 *      'MOMENT',20X,'BEAM' / 2X,'IJ  I  J  M  N',3X,'BUCKLING',
                 *      4X,'TENSION   COMPRESSION  LATERAL(Y) VERTICAL(Z)',3X,
                 *      'ROLL(X)',5X,'PITCH(Y)',5X,'YAW(Z)',3X,'IJ  I  J  M  N' / )
ISN 0205           DO 2400 IJ=1,NB
ISN 0206           IF(YY(IJ) .LE. ZZ(IJ)) GO TO 5013
ISN 0208           YZMIN(IJ)=ZZ(IJ)
ISN 0209           GO TO 5014
              C     YZMIN = MIN.CROSS SECTION AREA INERTIA
ISN 0210      5013 YZMIN(IJ)=YY(IJ)
              C     CALC.FORCES AND MOMENTS
              C     AXIAL FORCES
ISN 0211      5014 PCRFFY=4.*PI*PI*E(IJ)*YY(IJ)/(XLB(IJ)**2)
ISN 0212           PCRFFZ=4.*PI*PI*E(IJ)*ZZ(IJ)/(XLB(IJ)**2)
ISN 0213           PTENS=STENS(MC(IJ))*AA(IJ)
ISN 0214           PCOMP=SCOMP(MC(IJ))*AA(IJ)
              C     SHEAR FORCES
ISN 0215           FY=.67*SHEAR(MC(IJ))*AA(IJ)
ISN 0216           FZ=FY
              C     MOMENTS
ISN 0217           IF(XIQ(IJ).NE.0.) GO TO 400
ISN 0219           TMOMX = 0.
ISN 0220           GO TO 410
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ISN 0221      400 TMOMX=SHEAR(MC(IJ))/XIQ(IJ)
ISN 0222      410 SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))
ISN 0223          IF(Z1(IJ).NE.0.) GO TO 420
ISN 0225          BENDMY = 0.
ISN 0226          GO TO 430
ISN 0227      420 BENDMY=SYIELD*YY(IJ)/Z1(IJ)
ISN 0228      430 IF(Z2(IJ).NE.0.) GO TO 440
ISN 0230          BENDMZ = 0.
ISN 0231          GO TO 450
ISN 0232      440 BENDMZ=SYIELD*ZZ(IJ)/Z2(IJ)
            C
            C     CHECK BEAM END CONDITIONS.
            C
ISN 0233      450 IF(PY(IJ).EQ.0.AND.PYJ(IJ).EQ.0) GO TO 100
ISN 0235          IF(PY(IJ).EQ.0.OR.PYJ(IJ).EQ.0) GO TO 110
            C  PINNED-PINNED.
ISN 0237          PCRY = PCRFFY/4.
ISN 0238          BENDMY = 0.
ISN 0239          FZ = 0.
ISN 0240          GO TO 120
            C  FIXED-PINNED.
ISN 0241      110 PCRY = PCRFFY/2.
ISN 0242          GO TO 120
            C  FIXED-FIXED
ISN 0243      100 PCRY = PCRFFY
ISN 0244      120 IF(PZ(IJ).EQ.0.AND.PZJ(IJ).EQ.0) GO TO 200
ISN 0246          IF(PZ(IJ).EQ.0.OR.PZJ(IJ).EQ.0) GO TO 210
            C  PINNED-PINNED.
ISN 0248          PCRZ = PCRFFZ/4.
ISN 0249          BENDMZ = 0.
ISN 0250          FY = 0.
ISN 0251          GO TO 220
            C  FIXED-PINNED.
ISN 0252      210 PCRZ = PCRFFZ/2.
ISN 0253          GO TO 220
            C  FIXED-FIXED
ISN 0254      200 PCRZ = PCRFFZ
ISN 0255      220 PCR(IJ) = PCRZ
ISN 0256          IF(PCRY.LT.PCRZ) PCR(IJ)=PCRY
ISN 0258     5018 PRINT 5015,(IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),PCR(IJ),PTENS,
                1 PCOMP,FY,FZ,TMOMX,BENDMY,BENDMZ,IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ))
ISN 0259     5015 FORMAT(1X,5I3,1P8E12.4,5I3)
ISN 0260     2400 CONTINUE
ISN 0261          PRINT 5050
ISN 0262     5050 FORMAT(// 1X,'BEAM DEFLECTIONS')
ISN 0263          PRINT 5051
ISN 0264     5051 FORMAT(// 6X,'BEAM',17X,'DEFLECTION',25X,'TRANSLATION DUE TO',23X,
                *     'ROTATION ABOUT' / 2X,'IJ  I  J  M  N',2X,'BUCKLING',4X,
                *     'TENSION  COMPRESSION   F(Y)',7X,'F(Z)',7X,'BM(Z)',6X,
                *     'BM(Y)',5X,'X-AXIS       Y-AXIS        Z-AXIS' / )
            C
            C     CALC.DEFLECTIONS
            C
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         C     AXIAL DEFLECTIONS
         C
ISN 0265       DO 2500 IJ=1,NB
ISN 0266       SYIELD = AMIN1(SCOMP(MC(IJ)),STENS(MC(IJ)))
ISN 0267       IF(XK3(1,1,IJ) .EQ. 0.0) GO TO 5330
ISN 0269       XDEFB=PCR(IJ)/XK3(1,1,IJ)
ISN 0270       XDEFT=STENS(MC(IJ))*AA(IJ)/XK3(1,1,IJ)
ISN 0271       XDEFC=SCOMP(MC(IJ))*AA(IJ)/XK3(1,1,IJ)
ISN 0272       GO TO 5340
ISN 0273  5330 XDEFB = 0.0
ISN 0274       XDEFT = 0.0
ISN 0275       XDEFC = 0.0
ISN 0276  5340 CONTINUE
         C     DUE TO SHEAR FORCES
ISN 0277       IF(XK3(2,2,IJ) .EQ. 0.0) GO TO 5350
ISN 0279       YDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(2,2,IJ)
ISN 0280       GO TO 5360
ISN 0281  5350 YDSF = 0.0
ISN 0282  5360 IF(XK3(3,3,IJ) .EQ. 0.0) GO TO 5370
ISN 0284       ZDSF=.67*SHEAR(MC(IJ))*AA(IJ)/XK3(3,3,IJ)
ISN 0285       GO TO 5380
ISN 0286  5370 ZDSF = 0.0
ISN 0287  5380 CONTINUE
         C     DEFL. DUE TO BEND.FORCE      ((K55/DEL)*FORCE)
ISN 0288       IF(XK3(2,2,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5390
ISN 0290       YMOMZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XLB(IJ)*XK3(2,2,IJ))
ISN 0291       GO TO 5400
ISN 0292  5390 YMOMZ = 0.0
ISN 0293  5400 IF(XK3(3,3,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5410
ISN 0295       ZMOMY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XLB(IJ)*XK3(3,3,IJ))
ISN 0296       GO TO 5420
ISN 0297  5410 ZMOMY = 0.0
ISN 0298  5420 CONTINUE
         C     TORSIONAL ROTATION
ISN 0299       IF(XK3(4,4,IJ).NE.0.AND.XIQ(IJ).NE.0.) GO TO 5317
ISN 0301       ROTX=0.0
ISN 0302       GO TO 5318
ISN 0303  5317 ROTX=SHEAR(MC(IJ))/XIQ(IJ)/XK3(4,4,IJ)
         C     BEND. ROTATION     ((K33/DEL)*MOM.)
ISN 0304  5318 IF(XK3(5,5,IJ).EQ.0.OR.Z1(IJ).EQ.0.) GO TO 5430
ISN 0306       ROTY=4.*SYIELD*YY(IJ)/(Z1(IJ)*XK3(5,5,IJ))
ISN 0307       GO TO 5440
ISN 0308  5430 ROTY = 0.0
ISN 0309  5440 IF(XK3(6,6,IJ).EQ.0.OR.Z2(IJ).EQ.0.) GO TO 5450
ISN 0311       ROTZ=4.*SYIELD*ZZ(IJ)/(Z2(IJ)*XK3(6,6,IJ))
ISN 0312       GO TO 5460
ISN 0313  5450 ROTZ = 0.0
ISN 0314  5460 CONTINUE
ISN 0315  5316 PRINT 5319, (IJ,IG(IJ),JG(IJ),MG(IJ),NG(IJ),XDEFB,XDEFT,XDEFC,
              1 YDSF,ZDSF,YMOMZ,ZMOMY,ROTX,ROTY,ROTZ)
ISN 0316  5319 FORMAT(1X,5I3,1P10E11.3)
ISN 0317  2500 CONTINUE
ISN 0318       RETURN
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ISN 0319 END 00003590

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COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                   SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
          C         DATA SET D2334RSIN  AT LEVEL 006 AS OF 06/25/79
          C         DATA SET D2332VRI   AT LEVEL 005 AS OF 01/27/78
ISN 0002            SUBROUTINE RSIN(IMODEL,ICASE,IMSEC)
          C
          C
          C
ISN 0003            IMPLICIT REAL*8(A-H,O-Z)
ISN 0004            REAL*8 KUN, MODEL, IMODEL, KEI, KETOTL
ISN 0005            REAL*4 XKS, XKI, XKR, ENGSMY
ISN 0006            INTEGER*4 TITLE(40),UNIT,CASE,HEADER(24),BPL(100,3)
ISN 0007            INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)
ISN 0008            INTEGER*2 NLSFLG,CHUG,NI,IJPR,NN,INBUFF,IG,JG,IBS,JBS
ISN 0009            COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),
                   1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),
                   2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),
                   3             MVP
ISN 0010            COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),
                   1             FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)
ISN 0011            COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),
                   1               XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,
                   2               PETOTL,SETOTL,DETOTL,CETOTL,FETOTL
ISN 0012            COMMON/MADE/ KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,
                   1 TPL(100),BPL,KPL
ISN 0013            COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),
                   1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)
ISN 0014            COMMON/INPR/ NDRI,NSP
ISN 0015            COMMON                   XX(80),XY(80),XZ(80),XL(80),XM(80),
                   1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),
                   2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),
                   5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),
                   6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),
                   7 PHIOLD(80),THEOLD(80),PSIOLD(80),
                   8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),
                   9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),
                   A TKR(200),TPEN(80),DTHALF,
                   B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT
ISN 0016            COMMON/NP00I4/ NNP
ISN 0017            COMMON/NP01R8/ XNP(50),YNP(50),ZNP(50),UNP(50),VNP(50),WNP(50),
                   1 XDNP(50),YDNP(50),ZDNP(50),XACCNP(50),YACCNP(50),ZACCNP(50),
                   2 SBUCKR(150),PCR(150)
ISN 0018            COMMON/PRMA/ XACF(80),YACF(8C),ZACF(80),XACNPF(50),YACNPF(50),
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                   1 ZACNPF(50),XIMP(80),YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                   2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                   3 YIMNPL(50),ZIMNPL(50)
ISN 0019             COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),
                   1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),
                   2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO
ISN 0020             COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                   1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                   2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                   3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                   4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                   5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                   6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                   7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                   8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                   9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                   A CEIKF(40),
                   B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                   C NM,NB,I,J,IG(150),JG(150),
                   D N1(900),NN(40),IJPR(150)
ISN 0021             COMMON/CFPR/FSPRNG(40,8),DELG(40)
ISN 0022             COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),
                   1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                   2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0023             COMMON/MAPR/ ETOTTO, ENGSMY(6,200), INGSCT
ISN 0024             COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,NPH,NMTL,NPTS(50),
                   1 NVBM,IJPRT(14),IPHDP(80),NFBM
ISN 0025             COMMON /MAX/ IRUPSW(150), IPENSW(80), VEEBAR(900), ZINIT(80),
                   1              DPHIIJ(150), FUB(150)
ISN 0026             DATA UNIT/21/
                C  ...FIND DESIRED CASE...
                C
ISN 0027          10 CALL OPNIN(HEADER,24,UNIT,IER)
ISN 0028             IF (IER .NE. 0) STOP
ISN 0030             CALL DATIN(MODEL  ,8HMODEL   ,2,UNIT,IER)
ISN 0031             CALL DATIN(CASE   ,8HCASE    ,1,UNIT,IER)
ISN 0032             CALL DATIN(MSEC   ,8HMSEC    ,1,UNIT,IER)
ISN 0033             IF ( (MODEL.EQ.IMODEL) .AND. (CASE.EQ.ICASE)
                   1                        .AND. (MSEC.EQ.IMSEC) )   GO TO 20
ISN 0035             CALL CLSIN(UNIT,IER)
ISN 0036             IF (IER .NE. 0) STOP
ISN 0038             GO TO 10
                C
                C  ...RETRIEVE VARIABLES...
                C
ISN 0039          20 CALL DATIN(TIME   ,8HTIME    ,2,UNIT,IER)
                C
                C     ...INDICES...
                C
ISN 0040             CALL DATIN(KRCONT,8HKRCONT  ,1,UNIT,IER)
ISN 0041             CALL DATIN(KPEN  ,8HKPEN    ,1,UNIT,IER)
ISN 0042             CALL DATIN(KKONT ,8HKKONT   ,1,UNIT,IER)
ISN 0043             CALL DATIN(KPL   ,8HKPL     ,1,UNIT,IER)
```

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         C                                                                   00000940
         C      ...ARRAYS...                                                 00000950
         C                                                                   00000960
ISN 0044        NM2 = 2*NM1                                                  00000970
ISN 0045        CALL DATIN(P     ,8HP      ,NM2,UNIT,IER)                    00000980
ISN 0046        CALL DATIN(Q     ,8HQ      ,NM2,UNIT,IER)                    00000990
ISN 0047        CALL DATIN(R     ,8HR      ,NM2,UNIT,IER)                    00001000
ISN 0048        CALL DATIN(U     ,8HU      ,NM2,UNIT,IER)                    00001010
ISN 0049        CALL DATIN(V     ,8HV      ,NM2,UNIT,IER)                    00001020
ISN 0050        CALL DATIN(W     ,8HW      ,NM2,UNIT,IER)                    00001030
ISN 0051        CALL DATIN(X     ,8HX      ,NM2,UNIT,IER)                    00001040
ISN 0052        CALL DATIN(Y     ,8HY      ,NM2,UNIT,IER)                    00001050
ISN 0053        CALL DATIN(Z     ,8HZ      ,NM2,UNIT,IER)                    00001060
ISN 0054        CALL DATIN(PHI   ,8HPHI    ,NM2,UNIT,IER)                    00001070
ISN 0055        CALL DATIN(THETA ,8HTHETA  ,NM2,UNIT,IER)                    00001080
ISN 0056        CALL DATIN(PSI   ,8HPSI    ,NM2,UNIT,IER)                    00001090
ISN 0057        CALL DATIN(PDOT  ,8HPDOT   ,NM2,UNIT,IER)                    00001100
ISN 0058        CALL DATIN(QDOT  ,8HQDOT   ,NM2,UNIT,IER)                    00001110
ISN 0059        CALL DATIN(RDOT  ,8HRDOT   ,NM2,UNIT,IER)                    00001120
ISN 0060        CALL DATIN(UDOT  ,8HUDOT   ,NM2,UNIT,IER)                    00001130
ISN 0061        CALL DATIN(VDOT  ,8HVDOT   ,NM2,UNIT,IER)                    00001140
ISN 0062        CALL DATIN(WDOT  ,8HWDOT   ,NM2,UNIT,IER)                    00001150
ISN 0063        CALL DATIN(XDOT  ,8HXDOT   ,NM2,UNIT,IER)                    00001160
ISN 0064        CALL DATIN(YDOT  ,8HYDOT   ,NM2,UNIT,IER)                    00001170
ISN 0065        CALL DATIN(ZDOT  ,8HZDOT   ,NM2,UNIT,IER)                    00001180
ISN 0066        CALL DATIN(PHIDOT,8HPHIDOT ,NM2,UNIT,IER)                    00001190
ISN 0067        CALL DATIN(THEDOT,8HTHEDOT ,NM2,UNIT,IER)                    00001200
ISN 0068        CALL DATIN(PSIDOT,8HPSIDOT ,NM2,UNIT,IER)                    00001210
ISN 0069        CALL DATIN(POLD  ,8HPOLD   ,NM2,UNIT,IER)                    00001220
ISN 0070        CALL DATIN(QOLD  ,8HQOLD   ,NM2,UNIT,IER)                    00001230
ISN 0071        CALL DATIN(ROLD  ,8HROLD   ,NM2,UNIT,IER)                    00001240
ISN 0072        CALL DATIN(UOLD  ,8HUOLD   ,NM2,UNIT,IER)                    00001250
ISN 0073        CALL DATIN(VOLD  ,8HVOLD   ,NM2,UNIT,IER)                    00001260
ISN 0074        CALL DATIN(WOLD  ,8HWOLD   ,NM2,UNIT,IER)                    00001270
ISN 0075        CALL DATIN(XOLD  ,8HXOLD   ,NM2,UNIT,IER)                    00001280
ISN 0076        CALL DATIN(YOLD  ,8HYOLD   ,NM2,UNIT,IER)                    00001290
ISN 0077        CALL DATIN(ZOLD  ,8HZOLD   ,NM2,UNIT,IER)                    00001300
ISN 0078        CALL DATIN(PHIOLD,8HPHIOLD ,NM2,UNIT,IER)                    00001310
ISN 0079        CALL DATIN(THEOLD,8HTHEOLD ,NM2,UNIT,IER)                    00001320
ISN 0080        CALL DATIN(PSIOLD,8HPSIOLD ,NM2,UNIT,IER)                    00001330
ISN 0081        CALL DATIN(DX    ,8HDX     ,NM2,UNIT,IER)                    00001340
ISN 0082        CALL DATIN(DY    ,8HDY     ,NM2,UNIT,IER)                    00001350
ISN 0083        CALL DATIN(DZ    ,8HDZ     ,NM2,UNIT,IER)                    00001360
ISN 0084        CALL DATIN(XACC  ,8HXACC   ,NM2,UNIT,IER)                    00001370
ISN 0085        CALL DATIN(YACC  ,8HYACC   ,NM2,UNIT,IER)                    00001380
ISN 0086        CALL DATIN(ZACC  ,8HZACC   ,NM2,UNIT,IER)                    00001390
ISN 0087        CALL DATIN(XACF  ,8HXACF   ,NM2,UNIT,IER)                    00001400
ISN 0088        CALL DATIN(YACF  ,8HYACF   ,NM2,UNIT,IER)                    00001410
ISN 0089        CALL DATIN(ZACF  ,8HZACF   ,NM2,UNIT,IER)                    00001420
ISN 0090        CALL DATIN(XACFD ,8HXACFD  ,NM2,UNIT,IER)                    00001430
ISN 0091        CALL DATIN(YACFD ,8HYACFD  ,NM2,UNIT,IER)                    00001440
ISN 0092        CALL DATIN(ZACFD ,8HZACFD  ,NM2,UNIT,IER)                    00001450
ISN 0093        CALL DATIN(XAFOLD,8HXAFOLD ,NM2,UNIT,IER)                    00001460
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      CALL DATIN(YAFOLD,8HYAFOLD  ,NM2,UNIT,IER)
      CALL DATIN(ZAFOLD,8HZAFOLD  ,NM2,UNIT,IER)
      CALL DATIN(XIMP  ,8HXIMP    ,NM2,UNIT,IER)
      CALL DATIN(YIMP  ,8HYIMP    ,NM2,UNIT,IER)
      CALL DATIN(ZIMP  ,8HZIMP    ,NM2,UNIT,IER)
      CALL DATIN(XIMPOL,8HXIMPOL  ,NM2,UNIT,IER)
      CALL DATIN(YIMPOL,8HYIMPOL  ,NM2,UNIT,IER)
      CALL DATIN(ZIMPOL,8HZIMPOL  ,NM2,UNIT,IER)
      CALL DATIN(ZINIT ,8HZINIT   ,NM2,UNIT,IER)
      CALL DATIN(PINO  ,8HPINO    ,NM2,UNIT,IER)
      CALL DATIN(QINO  ,8HQINO    ,NM2,UNIT,IER)
      CALL DATIN(RINO  ,8HRINO    ,NM2,UNIT,IER)
      CALL DATIN(DPIN  ,8HDPIN    ,NM2,UNIT,IER)
      CALL DATIN(DQIN  ,8HDQIN    ,NM2,UNIT,IER)
      CALL DATIN(DRIN  ,8HDRIN    ,NM2,UNIT,IER)
      CALL DATIN(PIN   ,8HPIN     ,NM2,UNIT,IER)
      CALL DATIN(QIN   ,8HQIN     ,NM2,UNIT,IER)
      CALL DATIN(RIN   ,8HRIN     ,NM2,UNIT,IER)
      CALL DATIN(KEI   ,8HKEI     ,NM2,UNIT,IER)
      CALL DATIN(PEI   ,8HPEI     ,NM2,UNIT,IER)
      CALL DATIN(XSE   ,8HXSE     ,NM2,UNIT,IER)
      CALL DATIN(XDE   ,8HXDE     ,NM2,UNIT,IER)
      CALL DATIN(XCE   ,8HXCE     ,NM2,UNIT,IER)
      CALL DATIN(XFE   ,8HXFE     ,NM2,UNIT,IER)
      CALL DATIN(XETOT ,8HXETOT   ,NM2,UNIT,IER)
      CALL DATIN(XPCT  ,8HXPCT    ,NM2,UNIT,IER)
      CALL DATIN(XETOTO,8HXETOTO  ,NM2,UNIT,IER)
      NM9 = 9*2*NM
      CALL DATIN(BIJ   ,8HBIJ     ,NM9,UNIT,IER)
      CALL DATIN(IPENSW,8HIPENSW  ,NM ,UNIT,IER)
C
C
C
      NNP2 = 2*NNP
      CALL DATIN(XNP   ,8HXNP     ,NNP2,UNIT,IER)
      CALL DATIN(YNP   ,8HYNP     ,NNP2,UNIT,IER)
      CALL DATIN(ZNP   ,8HZNP     ,NNP2,UNIT,IER)
      CALL DATIN(XDNP  ,8HXDNP    ,NNP2,UNIT,IER)
      CALL DATIN(YDNP  ,8HYDNP    ,NNP2,UNIT,IER)
      CALL DATIN(ZDNP  ,8HZDNP    ,NNP2,UNIT,IER)
      CALL DATIN(UNP   ,8HUNP     ,NNP2,UNIT,IER)
      CALL DATIN(VNP   ,8HVNP     ,NNP2,UNIT,IER)
      CALL DATIN(WNP   ,8HWNP     ,NNP2,UNIT,IER)
      CALL DATIN(XACCNP,8HXACCNP  ,NNP2,UNIT,IER)
      CALL DATIN(YACCNP,8HYACCNP  ,NNP2,UNIT,IER)
      CALL DATIN(ZACCNP,8HZACCNP  ,NNP2,UNIT,IER)
      CALL DATIN(XACNPF,8HXACNPF  ,NNP2,UNIT,IER)
      CALL DATIN(YACNPF,8HYACNPF  ,NNP2,UNIT,IER)
      CALL DATIN(ZACNPF,8HZACNPF  ,NNP2,UNIT,IER)
      CALL DATIN(XNPFD ,8HXNPFD   ,NNP2,UNIT,IER)
      CALL DATIN(YNPFD ,8HYNPFD   ,NNP2,UNIT,IER)
      CALL DATIN(ZNPFD ,8HZNPFD   ,NNP2,UNIT,IER)
      CALL DATIN(XANPFO,8HXANPFO  ,NNP2,UNIT,IER)
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      CALL DATIN(YANPFO,8HYANPFO   ,NNP2,UNIT,IER)
      CALL DATIN(ZANPFO,8HZANPFO   ,NNP2,UNIT,IER)
      CALL DATIN(XIMPNP,8HXIMPNP   ,NNP2,UNIT,IER)
      CALL DATIN(YIMPNP,8HYIMPNP   ,NNP2,UNIT,IER)
      CALL DATIN(ZIMPNP,8HZIMPNP   ,NNP2,UNIT,IER)
      CALL DATIN(XIMNPL,8HXIMNPL   ,NNP2,UNIT,IER)
      CALL DATIN(YIMNPL,8HYIMNPL   ,NNP2,UNIT,IER)
      CALL DATIN(ZIMNPL,8HZIMNPL   ,NNP2,UNIT,IER)
C
C
C
      NB2 = 2*NB
      CALL DATIN(KFL35 ,8HKFL35    ,NB,UNIT,IER)
      CALL DATIN(KFL26 ,8HKFL26    ,NB,UNIT,IER)
      CALL DATIN(FL26I ,8HFL26I    ,NB,UNIT,IER)
      CALL DATIN(FL26J ,8HFL26J    ,NB,UNIT,IER)
      CALL DATIN(FL35I ,8HFL35I    ,NB,UNIT,IER)
      CALL DATIN(FL35J ,8HFL35J    ,NB,UNIT,IER)
      CALL DATIN(SEIJ  ,8HSEIJ     ,NB2,UNIT,IER)
      CALL DATIN(DEIJ  ,8HDEIJ     ,NB2,UNIT,IER)
      CALL DATIN(IRUPSW,8HIRUPSW   ,NB,UNIT,IER)
      CALL DATIN(DPHIIJ,8HDPHIIJ   ,NB2,UNIT,IER)
      CALL DATIN(PHIIJ ,8HPHIIJ    ,NB2,UNIT,IER)
      CALL DATIN(THEIJ ,8HTHEIJ    ,NB2,UNIT,IER)
      CALL DATIN(PSIIJ ,8HPSIIJ    ,NB2,UNIT,IER)
      CALL DATIN(SBUCKR,8HSBUCKR   ,NB2,UNIT,IER)
      CALL DATIN(DRI   ,8HDRI      ,NB2,UNIT,IER)
      CALL DATIN(FUB   ,8HFUB      ,NB2,UNIT,IER)
      NB4 = 2*2*NB
      CALL DATIN(VEEN  (1,1),8HVEEN    ,NB4,UNIT,IER)
      NB12 = 2*6*NB
      CALL DATIN(SUMDF (1,1),8HSUMDF   ,NB12,UNIT,IER)
      CALL DATIN(FINT  (1,1),8HFINT    ,NB12,UNIT,IER)
      CALL DATIN(SUMDFI(1,1),8HSUMDFI  ,NB12,UNIT,IER)
      CALL DATIN(FINTI (1,1),8HFINTI   ,NB12,UNIT,IER)
      NB18 = 2*9*NB
      CALL DATIN(VEEBAR,8HVEEBAR   ,NB18,UNIT,IER)
      NB6 = 6*NB
      NB3 = 3*NB
      NB12 = 6*2*NB
      CALL DATIN(N1    ,8HN1       ,NB3,UNIT,IER)
      CALL DATIN(VEE   ,8HVEE      ,NB12,UNIT,IER)
      CALL DATIN(KRFLAG,8HKRFLAG   ,NB6,UNIT,IER)
      NOL2=2*NOLEO
      CALL DATIN(YOLEO   ,8HYOLEO    ,NOL2,UNIT,IER)
      DO 100  K = 1,4
        CALL DATIN(FRD   (1,K),8HFRD      ,NB2,UNIT,IER)
        CALL DATIN(FRS   (1,K),8HFRS      ,NB2,UNIT,IER)
  100 CONTINUE
      NLI = NLB/2 + MOD(NLB,2)
      CALL DATIN(CHUG  ,8HCHUG     ,NLI,UNIT,IER)
C
C
```

```
C
      KR2 = 2*KRCONT
      CALL DATIN(TKR    ,8HTKR      ,KR2,UNIT,IER)
      KR4 = 4*KRCONT
      CALL DATIN(KRBEAM(1,1),8HKRBEAM   ,KR4,UNIT,IER)
      CALL DATIN(IPEN   ,8HIPEN     ,KPEN,UNIT,IER)
      KPEN2 = 2*KPEN
      CALL DATIN(TPEN   ,8HTPEN     ,KPEN2,UNIT,IER)
      KPL2=2*KPL
      CALL DATIN(TPL    ,8HTPL      ,KPL2,UNIT,IER)
      DO 120 K=1,3
      CALL DATIN(BPL(1,K),8HBPL      ,KPL,UNIT,IER)
  120 CONTINUE
C
C
C
      KK2=2*KKONT
      CALL DATIN(TSP    ,8HTSP      ,KK2,UNIT,IER)
      KK5=5*KKONT
      CALL DATIN(KKSP(1,1),8HKKSP     ,KK5,UNIT,IER)
      KK52=5*2*KKONT
      CALL DATIN(EXSP(1,1),8HEXSP     ,KK52,UNIT,IER)
      NSP2 = 2*NSP
      NS2 = NSP/2 + MOD(NSP,2)
      CALL DATIN(DELG   ,8HDELG     ,NSP2,UNIT,IER)
      CALL DATIN(IBS    ,8HIBS      ,NS2,UNIT,IER)
      CALL DATIN(JBS    ,8HJBS      ,NS2,UNIT,IER)
      CALL DATIN(SBAR   ,8HSBAR     ,NSP2,UNIT,IER)
      CALL DATIN(FSPBAR,8HFSPBAR   ,NSP2,UNIT,IER)
      CALL DATIN(FSPOP ,8HFSPOP    ,NSP2,UNIT,IER)
      CALL DATIN(SCP    ,8HSCP      ,NSP2,UNIT,IER)
      CALL DATIN(STEMP1,8HSTEMP1   ,NSP2,UNIT,IER)
      CALL DATIN(STEMP2,8HSTEMP2   ,NSP2,UNIT,IER)
      CALL DATIN(STEMP3,8HSTEMP3   ,NSP2,UNIT,IER)
      CALL DATIN(STEMP4,8HSTEMP4   ,NSP2,UNIT,IER)
      CALL DATIN(STEMP5,8HSTEMP5   ,NSP2,UNIT,IER)
      CALL DATIN(NN     ,8HNN       ,NS2,UNIT,IER)
      CALL DATIN(CEIK   ,8HCEIK     ,NSP2,UNIT,IER)
      CALL DATIN(CEIKF ,8HCEIKF    ,NSP2,UNIT,IER)
      CALL DATIN(SC     ,8HSC       ,NSP2,UNIT,IER)
      CALL DATIN(KUN    ,8HKUN      ,NSP2,UNIT,IER)
      DO 200 K=1,8
        CALL DATIN(FSPRNG(1,K),8HFSPRNG  ,NSP2,UNIT,IER)
  200 CONTINUE
      NVCH2 = 2*NVCH
      CALL DATIN(VOL    ,8HVOL      ,NVCH2,UNIT,IER)
      DO 300  K = 1,3
        CALL DATIN(DLVOL (1,K),8HDLVOL   ,NVCH2,UNIT,IER)
  300 CONTINUE
C
C
C
      CALL DATIN(XDOTAP,8HXDOTAP  ,2,UNIT,IER)
```

AD-A055 898 LOCKHEED-CALIFORNIA CO BURBANK F/G 1/2
GENERAL AVIATION AIRPLANE STRUCTURAL CRASHWORTHINESS USER'S MAN--ETC(U)
FEB 78 M A GAMON DOT-FA75WA-3707
UNCLASSIFIED LR-28307-VOL-1 FAA/RD-77/189-VOL-1 NL

AD A
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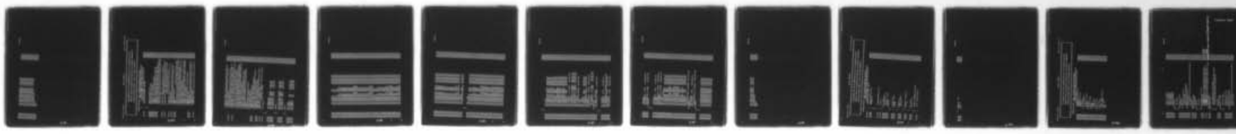

END
DATE
FILMED
7-80
DTIC

```
ISN 0238        CALL DATIN( YDOTAP,8HYDOTAP   ,2,UNIT,IER)                    00003060
ISN 0239        CALL DATIN( ZDOTAP,8HZDOTAP   ,2,UNIT,IER)                    00003070
ISN 0240        CALL DATIN( ETOTTO,8HETOTTO   ,2,UNIT,IER)                    00003080
ISN 0241        CALL DATIN( XETOTL,8HXETOTL   ,2,UNIT,IER)                    00003090
ISN 0242        CALL DATIN( KETOTL,8HKETOTL   ,2,UNIT,IER)                    00003100
ISN 0243        CALL DATIN( PETOTL,8HPETOTL   ,2,UNIT,IER)                    00003110
ISN 0244        CALL DATIN( SETOTL,8HSETOTL   ,2,UNIT,IER)                    00003120
ISN 0245        CALL DATIN( DETOTL,8HDETOTL   ,2,UNIT,IER)                    00003130
ISN 0246        CALL DATIN( CETOTL,8HCETOTL   ,2,UNIT,IER)                    00003140
ISN 0247        CALL DATIN( FETOTL,8HFETOTL   ,2,UNIT,IER)                    00003150
ISN 0248        CALL DATIN( INGSCT,8HINGSCT   ,1,UNIT,IER)                    00003160
ISN 0249        CALL CLSIN(UNIT,IER)                                          00003170
ISN 0250        RETURN                                                        00003180
ISN 0251        END                                                           00003190
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          COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                             SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                   C         DATA SET D2334RSOUT AT LEVEL 006 AS OF 06/25/79
                   C         DATA SET D2332VRO   AT LEVEL 005 AS OF 01/27/78       00000010
ISN 0002                SUBROUTINE RSOUT(MODEL,CASE,MSEC)                          00000020
                   C                                                               00000030
                   C                                                               00000040
                   C                                                               00000050
ISN 0003                IMPLICIT REAL*8(A-H,O-Z)                                   00000060
ISN 0004                REAL*8 KUN, MODEL, KEI, KETOTL                             00000070
ISN 0005                REAL*4 XKS, XKI, XKR, ENGSMY                               00000080
ISN 0006                INTEGER*4 TITLE(40),UNIT,CASE,BPL(100,3)                   00000090
ISN 0007                INTEGER*2 FL26I(150),FL26J(150),FL35I(150),FL35J(150)      00000100
ISN 0008                INTEGER*2 NLSFLG,CHUG,N1,IJPR,NN,INBUFF,IG,JG,IBS,JBS      00000110
ISN 0009                COMMON/DEIN/ XNBAR,XPBAR,YNBAR,YPBAR,ZNBAR,ZPBAR,VOLENZ(5,3),  00000120
                       1 FMAX(900),HEX(80),HEY(80),HEZ(80),ALIFT(80),VMAX(900),VMAXN(900),00000130
                       2 FMAXN(900),XKS(2700),XKI(2700),XKR(2700),NLSFLG(900),CHUG(180),  00000140
                       3             MVP                                           00000150
ISN 0010                COMMON/DEPR/ XDOTAP,YDOTAP,ZDOTAP,DLVOL(5,3),FRD(150,4),   00000160
                       1             FRS(150,4),SUMDFI(6,150),FINTI(6,150),VEEN(2,150)  00000170
ISN 0011                COMMON/ENERGY/ XPCT(80),XETOT(80),XETOTO(80),XSE(80),XDE(80),  00000180
                       1               XCE(80),XFE(80),KEI(80),PEI(80),XETOTL,KETOTL,  00000190
                       2               PETOTL,SETOTL,DETOTL,CETOTL,FETOTL          00000200
ISN 0012                COMMON/MADE/ KFL26(150),KFL35(150),FL26I,FL26J,FL35I,FL35J,  00000210
                       1 TPL(100),BPL,KPL                                          00000220
ISN 0013                COMMON/DINICP/ STENS(20),SCOMP(20),SHEAR(20),EE(20),GG(20),  00000230
                       1 FINT(6,150),VOL(5),VZERO(5),KMATR(6,4),NVCH,INBUFF(5,8)   00000240
ISN 0014                COMMON/INPR/ NDRI,NSP                                      00000250
ISN 0015                COMMON                 XX(80),XY(80),XZ(80),XL(80),XM(80),  00000260
                       1 XN(80),DPX(80),DPY(80),DPZ(80),DPL(80),DPM(80),DPN(80),PIN(80),  00000270
                       2 QIN(80),RIN(80),XI1(80),XI2(80),XI3(80),XI4(80),XI5(80),XI6(80),  00000280
                       5 DELI(80),POLD(80),QOLD(80),ROLD(80),UOLD(80),VOLD(80),    00000290
                       6 WOLD(80),XOLD(80),YOLD(80),ZOLD(80),PINO(80),QINO(80),RINO(80),  00000300
                       7 PHIOLD(80),THEOLD(80),PSIOLD(80),                         00000310
                       8 XACFD(80),YACFD(80),ZACFD(80),XAFOLD(80),YAFOLD(80),ZAFOLD(80),  00000320
                       9 XNPFD(50),YNPFD(50),ZNPFD(50),XANPFO(50),YANPFO(50),ZANPFO(50),  00000330
                       A TKR(200),TPEN(80),DTHALF,                                 00000340
                       B KRBEAM(4,200),KRFLAG(900),IPEN(80),KPEN,KRCONT            00000350
ISN 0016                COMMON/NP00I4/ NNP                                         00000360
ISN 0017                COMMON/NP01R8/ XNP(50),YNP(50),ZNP(50),UNP(50),VNP(50),WNP(50),  00000370
                       1 XDNP(50),YDNP(50),ZDNP(50),XACCNP(50),YACCNP(50),ZACCNP(50),  00000380
                       2 SBUCKR(150),PCR(150)                                      00000390
ISN 0018                COMMON/PRMA/ XACF(80),YACF(80),ZACF(80),XACNPF(50),YACNPF(50),  00000400
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                    1 ZACNPF(50),XIMP(80).YIMP(80),ZIMP(80),XIMPNP(50),YIMPNP(50),
                    2 ZIMPNP(50),XIMPOL(80),YIMPOL(80),ZIMPOL(80),XIMNPL(50),
                    3 YIMNPL(50),ZIMNPL(50)
ISN 0019              COMMON/OLEO/EOLEO(20),FAO(20),FAA(20),EXPOLE(20),YMAX(20),
                    1 YOLEO(20),BOLEO(20),BROLEO(20),XKEXT(20),XKCOMP(20),FCOUL(20),
                    2 ALPHAP,IGOLEO(20),JGOLEO(20),MGOLEO(20),NGOLEO(20),NOLEO
ISN 0020              COMMON/COMALL/ C(6,150),P(80),Q(80),R(80),U(80),V(80),W(80),X(81),
                    1 Y(81),Z(81),AI(9),AJ(9),SC(40),XC(6),XK(5400),XI(80),
                    2 YI(80),ZI(80),XYI(80),XZI(80),YZI(80),AIJ(9),BIJ(720),
                    3 DRI(150),OAI(720),VEE(900),WGT(80),PHI(80),THETA(80),PSI(80),
                    4 PDOT(80),QDOT(80),RDOT(80),UDOT(80),VDOT(80),WDOT(80),XDOT(80),
                    5 YDOT(80),ZDOT(80),PHIDOT(80),THEDOT(80),PSIDOT(80),TIME,DELTAT,
                    6 XACC(80),YACC(80),ZACC(80),AIDOT(9),
                    7 PHIIJ(150),THEIJ(150),PSIIJ(150),SUMDF(6,150),TITLE,
                    8 XLBAR(40),FSPBAR(40),VEEDOT(3,3),DX(81),DY(81),DZ(81),
                    9 DPIN(81),DQIN(81),DRIN(81),SEIJ(150),DEIJ(150),CEIK(40),
                    A CEIKF(40),
                    B SBAR(40),KUN(40),MAXNM,MAXIGS,MAXTBL,
                    C NM,NB,I,J,IG(150),JG(150),
                    D NI(900),NN(40),IJPR(150)
ISN 0021              COMMON/CFPR/FSPRNG(40,8),DELG(40)
ISN 0022              COMMON/MACF/IBS(40),FSPOP(40),SCP(40),JBS(40),
                    1 KKSP(5,200),EXSP(5,200),TSP(200),STEMP1(40),STEMP2(40),
                    2 STEMP3(40),STEMP4(40),STEMP5(40),KKONT
ISN 0023              COMMON/MAPR/ ETOTTO, ENGSMY(6,200), INGSCT
ISN 0024              COMMON/COMMI4/ND,NVBMN,NFBMN,NHI,NKM,NLB,NPH,NMTL,NPTS(50),
                    1 NVBM,IJPRT(14),IPHDP(80),NFBM
ISN 0025              COMMON /MAX/ IRUPSW(150), IPENSW(80), VEEBAR(900), ZINIT(80),
                    1              DPHIIJ(150), FUB(150)
ISN 0026              DATA UNIT/21/
              C
              C
              C
ISN 0027              CALL OPNOUT(UNIT)
ISN 0028              CALL DATOUT(MODEL ,8HMODEL    ,2,UNIT,IER)
ISN 0029              CALL DATOUT(CASE  ,8HCASE     ,1,UNIT,IER)
ISN 0030              CALL DATOUT(MSEC  ,8HMSEC     ,1,UNIT,IER)
ISN 0031              CALL DATOUT(TIME  ,8HTIME     ,2,UNIT,IER)
              C
              C    ...INDICES...
              C
ISN 0032              CALL DATOUT(KRCONT,8HKRCONT   ,1,UNIT,IER)
ISN 0033              CALL DATOUT(KPEN  ,8HKPEN     ,1,UNIT,IER)
ISN 0034              CALL DATOUT(KKONT ,8HKKONT    ,1,UNIT,IER)
ISN 0035              CALL DATOUT(KPL   ,8HKPL      ,1,UNIT,IER)
              C
              C    ...ARRAYS...
              C
ISN 0036              NM2 = 2*NM
ISN 0037              CALL DATOUT(P     ,8HP        ,NM2,UNIT,IER)
ISN 0038              CALL DATOUT(Q     ,8HQ        ,NM2,UNIT,IER)
ISN 0039              CALL DATOUT(R     ,8HR        ,NM2,UNIT,IER)
ISN 0040              CALL DATOUT(U     ,8HU        ,NM2,UNIT,IER)
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ISN 0041    CALL DATOUT(V     ,8HV      ,NM2,UNIT,IER)    00000940
ISN 0042    CALL DATOUT(W     ,8HW      ,NM2,UNIT,IER)    00000950
ISN 0043    CALL DATOUT(X     ,8HX      ,NM2,UNIT,IER)    00000960
ISN 0044    CALL DATOUT(Y     ,8HY      ,NM2,UNIT,IER)    00000970
ISN 0045    CALL DATOUT(Z     ,8HZ      ,NM2,UNIT,IER)    00000980
ISN 0046    CALL DATOUT(PHI   ,8HPHI    ,NM2,UNIT,IER)    00000990
ISN 0047    CALL DATOUT(THETA ,8HTHETA  ,NM2,UNIT,IER)    00001000
ISN 0048    CALL DATOUT(PSI   ,8HPSI    ,NM2,UNIT,IER)    00001010
ISN 0049    CALL DATOUT(PDOT  ,8HPDOT   ,NM2,UNIT,IER)    00001020
ISN 0050    CALL DATOUT(QDOT  ,8HQDOT   ,NM2,UNIT,IER)    00001030
ISN 0051    CALL DATOUT(RDOT  ,8HRDOT   ,NM2,UNIT,IER)    00001040
ISN 0052    CALL DATOUT(UDOT  ,8HUDOT   ,NM2,UNIT,IER)    00001050
ISN 0053    CALL DATOUT(VDOT  ,8HVDOT   ,NM2,UNIT,IER)    00001060
ISN 0054    CALL DATOUT(WDOT  ,8HWDOT   ,NM2,UNIT,IER)    00001070
ISN 0055    CALL DATOUT(XDOT  ,8HXDOT   ,NM2,UNIT,IER)    00001080
ISN 0056    CALL DATOUT(YDOT  ,8HYDOT   ,NM2,UNIT,IER)    00001090
ISN 0057    CALL DATOUT(ZDOT  ,8HZDOT   ,NM2,UNIT,IER)    00001100
ISN 0058    CALL DATOUT(PHIDOT,8HPHIDOT ,NM2,UNIT,IER)    00001110
ISN 0059    CALL DATOUT(THEDOT,8HTHEDOT ,NM2,UNIT,IER)    00001120
ISN 0060    CALL DATOUT(PSIDOT,8HPSIDOT ,NM2,UNIT,IER)    00001130
ISN 0061    CALL DATOUT(POLD  ,8HPOLD   ,NM2,UNIT,IER)    00001140
ISN 0062    CALL DATOUT(QOLD  ,8HQOLD   ,NM2,UNIT,IER)    00001150
ISN 0063    CALL DATOUT(ROLD  ,8HROLD   ,NM2,UNIT,IER)    00001160
ISN 0064    CALL DATOUT(UOLD  ,8HUOLD   ,NM2,UNIT,IER)    00001170
ISN 0065    CALL DATOUT(VOLD  ,8HVOLD   ,NM2,UNIT,IER)    00001180
ISN 0066    CALL DATOUT(WOLD  ,8HWOLD   ,NM2,UNIT,IER)    00001190
ISN 0067    CALL DATOUT(XOLD  ,8HXOLD   ,NM2,UNIT,IER)    00001200
ISN 0068    CALL DATOUT(YOLD  ,8HYOLD   ,NM2,UNIT,IER)    00001210
ISN 0069    CALL DATOUT(ZOLD  ,8HZOLD   ,NM2,UNIT,IER)    00001220
ISN 0070    CALL DATOUT(PHIOLD,8HPHIOLD ,NM2,UNIT,IER)    00001230
ISN 0071    CALL DATOUT(THEOLD,8HTHEOLD ,NM2,UNIT,IER)    00001240
ISN 0072    CALL DATOUT(PSIOLD,8HPSIOLD ,NM2,UNIT,IER)    00001250
ISN 0073    CALL DATOUT(DX    ,8HDX     ,NM2,UNIT,IER)    00001260
ISN 0074    CALL DATOUT(DY    ,8HDY     ,NM2,UNIT,IER)    00001270
ISN 0075    CALL DATOUT(DZ    ,8HDZ     ,NM2,UNIT,IER)    00001280
ISN 0076    CALL DATOUT(XACC  ,8HXACC   ,NM2,UNIT,IER)    00001290
ISN 0077    CALL DATOUT(YACC  ,8HYACC   ,NM2,UNIT,IER)    00001300
ISN 0078    CALL DATOUT(ZACC  ,8HZACC   ,NM2,UNIT,IER)    00001310
ISN 0079    CALL DATOUT(XACF  ,8HXACF   ,NM2,UNIT,IER)    00001320
ISN 0080    CALL DATOUT(YACF  ,8HYACF   ,NM2,UNIT,IER)    00001330
ISN 0081    CALL DATOUT(ZACF  ,8HZACF   ,NM2,UNIT,IER)    00001340
ISN 0082    CALL DATOUT(XACFD ,8HXACFD  ,NM2,UNIT,IER)    00001350
ISN 0083    CALL DATOUT(YACFD ,8HYACFD  ,NM2,UNIT,IER)    00001360
ISN 0084    CALL DATOUT(ZACFD ,8HZACFD  ,NM2,UNIT,IER)    00001370
ISN 0085    CALL DATOUT(XAFOLD,8HXAFOLD ,NM2,UNIT,IER)    00001380
ISN 0086    CALL DATOUT(YAFOLD,8HYAFOLD ,NM2,UNIT,IER)    00001390
ISN 0087    CALL DATOUT(ZAFOLD,8HZAFOLD ,NM2,UNIT,IER)    00001400
ISN 0088    CALL DATOUT(XIMP  ,8HXIMP   ,NM2,UNIT,IER)    00001410
ISN 0089    CALL DATOUT(YIMP  ,8HYIMP   ,NM2,UNIT,IER)    00001420
ISN 0090    CALL DATOUT(ZIMP  ,8HZIMP   ,NM2,UNIT,IER)    00001430
ISN 0091    CALL DATOUT(XIMPOL,8HXIMPOL ,NM2,UNIT,IER)    00001440
ISN 0092    CALL DATOUT(YIMPOL,8HYIMPOL ,NM2,UNIT,IER)    00001450
ISN 0093    CALL DATOUT(ZIMPOL,8HZIMPOL ,NM2,UNIT,IER)    00001460
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ISN 0094      CALL DATOUT(ZINIT ,8HZINIT   ,NM2,UNIT,IER)          00001470
ISN 0095      CALL DATOUT(PINO  ,8HPINO    ,NM2,UNIT,IER)          00001480
ISN 0096      CALL DATOUT(QINO  ,8HQINO    ,NM2,UNIT,IER)          00001490
ISN 0097      CALL DATOUT(RINO  ,8HRINO    ,NM2,UNIT,IER)          00001500
ISN 0098      CALL DATOUT(DPIN  ,8HDPIN    ,NM2,UNIT,IER)          00001510
ISN 0099      CALL DATOUT(DQIN  ,8HDQIN    ,NM2,UNIT,IER)          00001520
ISN 0100      CALL DATOUT(DRIN  ,8HDRIN    ,NM2,UNIT,IER)          00001530
ISN 0101      CALL DATOUT(PIN   ,8HPIN     ,NM2,UNIT,IER)          00001540
ISN 0102      CALL DATOUT(QIN   ,8HQIN     ,NM2,UNIT,IER)          00001550
ISN 0103      CALL DATOUT(RIN   ,8HRIN     ,NM2,UNIT,IER)          00001560
ISN 0104      CALL DATOUT(KEI   ,8HKEI     ,NM2,UNIT,IER)          00001570
ISN 0105      CALL DATOUT(PEI   ,8HPEI     ,NM2,UNIT,IER)          00001580
ISN 0106      CALL DATOUT(XSE   ,8HXSE     ,NM2,UNIT,IER)          00001590
ISN 0107      CALL DATOUT(XDE   ,8HXDE     ,NM2,UNIT,IER)          00001600
ISN 0108      CALL DATOUT(XCE   ,8HXCE     ,NM2,UNIT,IER)          00001610
ISN 0109      CALL DATOUT(XFE   ,8HXFE     ,NM2,UNIT,IER)          00001620
ISN 0110      CALL DATOUT(XETOT ,8HXETOT   ,NM2,UNIT,IER)          00001630
ISN 0111      CALL DATOUT(XPCT  ,8HXPCT    ,NM2,UNIT,IER)          00001640
ISN 0112      CALL DATOUT(XETOTO,8HXETOTO  ,NM2,UNIT,IER)          00001650
ISN 0113      NM9 = 9*2*NM                                         00001660
ISN 0114      CALL DATOUT(BIJ   ,8HBIJ     ,NM9,UNIT,IER)          00001670
ISN 0115      CALL DATOUT(IPENSW,8HIPENSW  ,NM ,UNIT,IER)          00001680
          C                                                        00001690
          C                                                        00001700
          C                                                        00001710
ISN 0116      NNP2 = 2*NNP                                         00001720
ISN 0117      CALL DATOUT(XNP   ,8HXNP     ,NNP2,UNIT,IER)         00001730
ISN 0118      CALL DATOUT(YNP   ,8HYNP     ,NNP2,UNIT,IER)         00001740
ISN 0119      CALL DATOUT(ZNP   ,8HZNP     ,NNP2,UNIT,IER)         00001750
ISN 0120      CALL DATOUT(XDNP  ,8HXDNP    ,NNP2,UNIT,IER)         00001760
ISN 0121      CALL DATOUT(YDNP  ,8HYDNP    ,NNP2,UNIT,IER)         00001770
ISN 0122      CALL DATOUT(ZDNP  ,8HZDNP    ,NNP2,UNIT,IER)         00001780
ISN 0123      CALL DATOUT(UNP   ,8HUNP     ,NNP2,UNIT,IER)         00001790
ISN 0124      CALL DATOUT(VNP   ,8HVNP     ,NNP2,UNIT,IER)         00001800
ISN 0125      CALL DATOUT(WNP   ,8HWNP     ,NNP2,UNIT,IER)         00001810
ISN 0126      CALL DATOUT(XACCNP,8HXACCNP  ,NNP2,UNIT,IER)         00001820
ISN 0127      CALL DATOUT(YACCNP,8HYACCNP  ,NNP2,UNIT,IER)         00001830
ISN 0128      CALL DATOUT(ZACCNP,8HZACCNP  ,NNP2,UNIT,IER)         00001840
ISN 0129      CALL DATOUT(XACNPF,8HXACNPF  ,NNP2,UNIT,IER)         00001850
ISN 0130      CALL DATOUT(YACNPF,8HYACNPF  ,NNP2,UNIT,IER)         00001860
ISN 0131      CALL DATOUT(ZACNPF,8HZACNPF  ,NNP2,UNIT,IER)         00001870
ISN 0132      CALL DATOUT(XNPFD ,8HXNPFD   ,NNP2,UNIT,IER)         00001880
ISN 0133      CALL DATOUT(YNPFD ,8HYNPFD   ,NNP2,UNIT,IER)         00001890
ISN 0134      CALL DATOUT(ZNPFD ,8HZNPFD   ,NNP2,UNIT,IER)         00001900
ISN 0135      CALL DATOUT(XANPFO,8HXANPFO  ,NNP2,UNIT,IER)         00001910
ISN 0136      CALL DATOUT(YANPFO,8HYANPFO  ,NNP2,UNIT,IER)         00001920
ISN 0137      CALL DATOUT(ZANPFO,8HZANPFO  ,NNP2,UNIT,IER)         00001930
ISN 0138      CALL DATOUT(XIMPNP,8HXIMPNP  ,NNP2,UNIT,IER)         00001940
ISN 0139      CALL DATOUT(YIMPNP,8HYIMPNP  ,NNP2,UNIT,IER)         00001950
ISN 0140      CALL DATOUT(ZIMPNP,8HZIMPNP  ,NNP2,UNIT,IER)         00001960
ISN 0141      CALL DATOUT(XIMNPL,8HXIMNPL  ,NNP2,UNIT,IER)         00001970
ISN 0142      CALL DATOUT(YIMNPL,8HYIMNPL  ,NNP2,UNIT,IER)         00001980
ISN 0143      CALL DATOUT(ZIMNPL,8HZIMNPL  ,NNP2,UNIT,IER)         00001990
```

```
          C                                                                        00002000
          C                                                                        00002010
          C                                                                        00002020
ISN 0144        NB2 = 2*NB                                                         00002030
ISN 0145        CALL DATOUT(KFL35 ,8HKFL35   ,NB,UNIT,IER)                         00002040
ISN 0146        CALL DATOUT(KFL26 ,8HKFL26   ,NB,UNIT,IER)                         00002050
ISN 0147        CALL DATOUT(FL26I ,8HFL26I   ,NB,UNIT,IER)                         00002060
ISN 0148        CALL DATOUT(FL26J ,8HFL26J   ,NB,UNIT,IER)                         00002070
ISN 0149        CALL DATOUT(FL35I ,8HFL35I   ,NB,UNIT,IER)                         00002080
ISN 0150        CALL DATOUT(FK35J ,8HFL35J   ,NB,UNIT,IER)                         00002090
ISN 0151        CALL DATOUT(SEIJ  ,8HSEIJ    ,NB2,UNIT,IER)                        00002100
ISN 0152        CALL DATOUT(DEIJ  ,8HDEIJ    ,NB2,UNIT,IER)                        00002110
ISN 0153        CALL DATOUT(IRUPSW,8HIRUPSW  ,NB,UNIT,IER)                         00002120
ISN 0154        CALL DATOUT(DPHIIJ,8HDPHIIJ  ,NB2,UNIT,IER)                        00002130
ISN 0155        CALL DATOUT(PHIIJ ,8HPHIIJ   ,NB2,UNIT,IER)                        00002140
ISN 0156        CALL DATOUT(THEIJ ,8HTHEIJ   ,NB2,UNIT,IER)                        00002150
ISN 0157        CALL DATOUT(PSIIJ ,8HPSIIJ   ,NB2,UNIT,IER)                        00002160
ISN 0158        CALL DATOUT(SBUCKR,8HSBUCKR  ,NB2,UNIT,IER)                        00002170
ISN 0159        CALL DATOUT(DRI   ,8HDRI     ,NB2,UNIT,IER)                        00002180
ISN 0160        CALL DATOUT(FUB   ,8HFUB     ,NB2,UNIT,IER)                        00002190
ISN 0161        NB4 = 2*2*NB                                                       00002200
ISN 0162        CALL DATOUT(VEEN  (1,1),8HVEEN     ,NB4,UNIT,IER)                  00002210
ISN 0163        NB12 = 2*6*NB                                                      00002220
ISN 0164        CALL DATOUT(SUMDF (1,1),8HSUMDF    ,NB12,UNIT,IER)                 00002230
ISN 0165        CALL DATOUT(FINT  (1,1),8HFINT     ,NB12,UNIT,IER)                 00002240
ISN 0166        CALL DATOUT(SUMDFI(1,1),8HSUMDFI   ,NB12,UNIT,IER)                 00002250
ISN 0167        CALL DATOUT(FINTI (1,1),8HFINTI    ,NB12,UNIT,IER)                 00002260
ISN 0168        NB18 = 2*9*NB                                                      00002270
ISN 0169        CALL DATOUT(VEEBAR,8HVEEBAR  ,NB18,UNIT,IER)                       00002280
ISN 0170        NB3 = 3*NB                                                         00002290
ISN 0171        NB6 = 6*NB                                                         00002300
ISN 0172        NB12 = 6*2*NB                                                      00002310
ISN 0173        CALL DATOUT(N1    ,8HN1      ,NB3,UNIT,IER)                        00002320
ISN 0174        CALL DATOUT(VEE   ,8HVEE     ,NB12,UNIT,IER)                       00002330
ISN 0175        CALL DATOUT(KRFLAG,8HKRFLAG  ,NB6,UNIT,IER)                        00002340
ISN 0176        NOL2=2*NOLEO                                                       00002350
ISN 0177        CALL DATOUT(YOLEO   ,8HYOLEO   ,NOL2,UNIT,IER)                     00002360
ISN 0178        DO 100  K = 1,4                                                    00002370
ISN 0179          CALL DATOUT(FRD    (1,K),8HFRD      ,NB2,UNIT,IER)               00002380
ISN 0180          CALL DATOUT(FRS    (1,K),8HFRS      ,NB2,UNIT,IER)               00002390
ISN 0181    100 CONTINUE                                                           00002400
ISN 0182        NLI = NLB/2 + MOD(NLB,2)                                           00002410
ISN 0183        CALL DATOUT(CHUG  ,8HCHUG    ,NLI,UNIT,IER)                        00002420
          C                                                                        00002430
          C                                                                        00002440
          C                                                                        00002450
ISN 0184        KR2 = 2*KRCONT                                                     00002460
ISN 0185        CALL DATOUT(TKR   ,8HTKR     ,KR2,UNIT,IER)                        00002470
ISN 0186        KR4 = 4*KRCONT                                                     00002480
ISN 0187        CALL DATOUT(KRBEAM(1,1),8HKRBEAM  ,KR4,UNIT,IER)                   00002490
ISN 0188        CALL DATOUT(IPEN  ,8HIPEN    ,KPEN,UNIT,IER)                       00002500
ISN 0189        KPEN2 = 2*KPEN                                                     00002510
ISN 0190        CALL DATOUT(TPEN  ,8HTPEN    ,KPEN2,UNIT,IER)                      00002520
```

```
ISN 0191          KPL2=2*KPL
ISN 0192          CALL DATOUT(TPL   ,8HTPL     ,KPL2,UNIT,IER)
ISN 0193          DO 120 K=1,3
ISN 0194          CALL DATOUT(BPL(1.K),8HBPL     ,KPL,UNIT,IER)
ISN 0195      120 CONTINUE
            C
            C
            C
ISN 0196          KK2=2*KKONT
ISN 0197          CALL DATOUT(TSP   ,8HTSP     ,KK2,UNIT,IER)
ISN 0198          KK5=5*KKONT
ISN 0199          CALL DATOUT(KKSP(1,1),8HKKSP     ,KK5,UNIT,IER)
ISN 0200          KK52=5*2*KKONT
ISN 0201          CALL DATOUT(EXSP(1,1),8HEXSP     ,KK52,UNIT,IER)
ISN 0202          NSP2 = 2*NSP
ISN 0203          NS2 = NSP/2 + MOD(NSP,2)
ISN 0204          CALL DATOUT(DELG  ,8HDELG    ,NSP2,UNIT,IER)
ISN 0205          CALL DATOUT(IBS   ,8HIBS     ,NS2,UNIT,IER)
ISN 0206          CALL DATOUT(JBS   ,8HJBS     ,NS2,UNIT,IER)
ISN 0207          CALL DATOUT(SBAR  ,8HSBAR    ,NSP2,UNIT,IER)
ISN 0208          CALL DATOUT(FSPBAR,8HFSPBAR  ,NSP2,UNIT,IER)
ISN 0209          CALL DATOUT(FSPOP ,8HFSPOP   ,NSP2,UNIT,IER)
ISN 0210          CALL DATOUT(SCP   ,8HSCP     ,NSP2,UNIT,IER)
ISN 0211          CALL DATOUT(STEMP1,8HSTEMP1  ,NSP2,UNIT,IER)
ISN 0212          CALL DATOUT(STEMP2,8HSTEMP2  ,NSP2,UNIT,IER)
ISN 0213          CALL DATOUT(STEMP3,8HSTEMP3  ,NSP2,UNIT,IER)
ISN 0214          CALL DATOUT(STEMP4,8HSTEMP4  ,NSP2,UNIT,IER)
ISN 0215          CALL DATOUT(STEMP5,8HSTEMP5  ,NSP2,UNIT,IER)
ISN 0216          CALL DATOUT(NN    ,8HNN      ,NS2,UNIT,IER)
ISN 0217          CALL DATOUT(CEIK  ,8HCEIK    ,NSP2,UNIT,IER)
ISN 0218          CALL DATOUT(CEIKF ,8HCEIKF   ,NSP2,UNIT,IER)
ISN 0219          CALL DATOUT(SC    ,8HSC      ,NSP2,UNIT,IER)
ISN 0220          CALL DATOUT(KUN   ,8HKUN     ,NSP2,UNIT,IER)
ISN 0221          DO 200 K=1,8
ISN 0222            CALL DATOUT(FSPRNG(1,K),8HFSPRNG   ,NSP2,UNIT,IER)
ISN 0223      200 CONTINUE
ISN 0224          NVCH2 = 2*NVCH
ISN 0225          CALL DATOUT(VOL   ,8HVOL     ,NVCH2,UNIT,IER)
ISN 0226          DO 300  K = 1,3
ISN 0227            CALL DATOUT(DLVOL (1,K),8HDLVOL   ,NVCH2,UNIT,IER)
ISN 0228      300 CONTINUE
            C
            C
            C
ISN 0229          CALL DATOUT(XDOTAP,8HXDOTAP  ,2,UNIT,IER)
ISN 0230          CALL DATOUT(YDOTAP,8HYDOTAP  ,2,UNIT,IER)
ISN 0231          CALL DATOUT(ZDOTAP,8HZDOTAP  ,2,UNIT,IER)
ISN 0232          CALL DATOUT(ETOTTO,8HETOTTO  ,2,UNIT,IER)
ISN 0233          CALL DATOUT(XETOTL,8HXETOTL  ,2,UNIT,IER)
ISN 0234          CALL DATOUT(KETOTL,8HKETOTL  ,2,UNIT,IER)
ISN 0235          CALL DATOUT(PETOTL,8HPETOTL  ,2,UNIT,IER)
ISN 0236          CALL DATOUT(SETOTL,8HSETOTL  ,2,UNIT,IER)
ISN 0237          CALL DATOUT(DETOTL,8HDETOTL  ,2,UNIT,IER)
```

```
ISN 0238          CALL DATOUT(CETCTL,8HCETOTL  ,2,UNIT,IER)          00003060
ISN 0239          CALL DATOUT(FETOTL,8HFETOTL  ,2,UNIT,IER)          00003070
ISN 0240          CALL DATOUT(INGSCT,8HINGSCT  ,1,UNIT,IER)          00003080
ISN 0241          CALL CLSOUT(UNIT)                                  00003090
ISN 0242          RETURN                                             00003100
ISN 0243          END                                                00003110
```

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```
        COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                       SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
                C         DATA SET D2334SHX   AT LEVEL 002 AS OF 05/17/78
ISN 0002              SUBROUTINE SHELLX(DARRAY,KEY,N)
                C
ISN 0003              IMPLICIT REAL*8(A-H,O-Z)
ISN 0004              INTEGER*2 N
                C
                C
                C
                C
ISN 0005              DIMENSION DARRAY(1),KEY(1)
                C
ISN 0006              IFIRST = 1
                C
ISN 0007           10 K = IFIRST - 1
ISN 0008              DO 20 I=IFIRST, N
ISN 0009              K = K + 1
ISN 0010              IF(KEY(K)) 20,20,40
ISN 0011           20 CONTINUE
                C
                C
ISN 0012              DO 30 I=1, N
ISN 0013           30 KEY(I) = -KEY(I)
ISN 0014              RETURN
                C
                C
ISN 0015           40 IFIRST = K
ISN 0016              TEMP = DARRAY(K)
ISN 0017              GO TO 60
                C
                C
ISN 0018           50 DARRAY(K) = DARRAY(IK)
ISN 0019              K = IK
                C
                C
ISN 0020           60 IK = KEY(K)
ISN 0021              KEY(K) = -IK
                C
                C     IK MUST BE COMPARED WITH IFIRST.
                C
ISN 0022              IF(IK - IFIRST) 50,70,50
                C
```

```
              C                                                    00000390
ISN 0023        70 DARRAY(K) = TEMP                                00000400
ISN 0024           GO TO 10                                        00000410
ISN 0025           END                                             00000420
```

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*******************************************************************************************
*                                                                                         *
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```
      COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=55,SIZE=0600K,
                         SOURCE,BCD,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,XREF
            C            DATA SET D2334SHM   AT LEVEL 002 AS OF 07/19/78
ISN 0002          SUBROUTINE SHELLM(KEY,M,N)                              00000010
ISN 0003          INTEGER*2 N                                             00000020
ISN 0004          DIMENSION KEY(1),M(1)                                   00000030
ISN 0005          IFIRST = 1                                              00000040
ISN 0006       10 K = IFIRST - 1                                          00000050
ISN 0007          DO 20 I=IFIRST, N                                       00000060
ISN 0008          K = K + 1                                               00000070
ISN 0009          IF(KEY(K)) 20,20,40                                     00000080
ISN 0010       20 CONTINUE                                                00000090
ISN 0011          DO 30 I=1, N                                            00000100
ISN 0012       30 KEY(I) = -KEY(I)                                        00000110
ISN 0013          RETURN                                                  00000120
ISN 0014       40 IFIRST = K                                              00000130
ISN 0015          MTEMP = M(K)                                            00000140
ISN 0016          GO TO 60                                                00000150
ISN 0017       50 M(K) = M(IK)                                            00000160
ISN 0018          K = IK                                                  00000170
ISN 0019       60 IK = KEY(K)                                             00000180
ISN 0020          KEY(K) = -IK                                            00000190
ISN 0021          IF(IK - IFIRST) 50,70,50                                00000200
ISN 0022       70 M(K) = MTEMP                                            00000210
ISN 0023          GO TO 10                                                00000220
ISN 0024          END                                                     00000230
```

```
ISN 0192          PYJ(IJ) = PTEMP(3)                                        00003060
ISN 0193          PZJ(IJ) = PTEMP(4)                                        00003070
ISN 0194          SF35(IJ)=PTEMPM(1)                                        00003080
ISN 0195          SF26(IJ)=PTEMPM(2)                                        00003090
ISN 0196          SF35J(IJ)=PTEMPM(3)                                       00003100
ISN 0197          SF26J(IJ)=PTEMPM(4)                                       00003110
ISN 0198     6120 CONTINUE                                                  00003120
            C                                                               00003130
            C     CARDS 0800                                                00003140
            C                                                               00003150
ISN 0199     6112 DO 6111 IJ=1,NB                                           00003160
ISN 0200          IJUB(IJ)=0                                                00003170
ISN 0201     6111 DB(IJ)=0.                                                 00003180
ISN 0202          IF(NUB.EQ.0) GO TO 6110                                   00003190
ISN 0204          DO 6114 JI=1,NUB                                          00003200
ISN 0205          READ 6116,M,I,N,J,IJTEMP,DBTEMP                           00003210
ISN 0206     6116 FORMAT(2(I2,I3),I5,E10.0)                                 00003220
ISN 0207          DO 6118 IJ=1,NB                                           00003230
ISN 0208          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))   00003240
                 1 GO TO 6119                                               00003250
ISN 0210     6118 CONTINUE                                                  00003260
ISN 0211     6119 IJUB(IJ)=IJTEMP                                           00003270
ISN 0212          DB(IJ)=DBTEMP                                             00003280
ISN 0213     6114 CONTINUE                                                  00003290
            C                                                               00003300
            C     CARD 0900                                                 00003310
            C                                                               00003320
ISN 0214     6110 IF(NOLEO.EQ.0) GO TO 6210                                 00003330
ISN 0216          READ 5301,ALPHAP                                          00003340
ISN 0217          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),   00003350  6211
                 1 EOLEO(IJ),FAO(IJ),FAA(IJ),EXPOLE(IJ),YMAX(IJ),IJ=1,NOLEO)       00003360
ISN 0218          READ 5306,(MGOLEO(IJ),IGOLEO(IJ),NGOLEO(IJ),JGOLEO(IJ),   00003370  6211
                 1 BOLEO(IJ),BROLEO(IJ),XKEXT(IJ),XKCOMP(IJ),FCOUL(IJ),IJ=1,NOLEO) 00003380  6211 FORMAT (2(I2,I3), 5E10.0)
ISN 0219     6210 READ 5600,DAMPC                                           00003390
ISN 0220     5600 FORMAT(E10.0)                                             00003400
            C                                                               00003410
            C      DAMPC=DAMPING COEFF. FOR ALL BEAMS                       00003420
            C      NO STANDARD DAMPC VALUE AS OF 3/79 VALUE MUST BE INPUT   00003430
            C      IF ND.NE.0 SET DESIRED CBAR TO VALUE READ IN             00003440
            C                                                               00003450
ISN 0221          CDUM=DAMPC                                                00003460
ISN 0222          DO 5549 IJ=1,NB                                           00003470
ISN 0223     5549 CBAR(IJ) = CDUM                                           00003480
            C                                                               00003490
            C     CARDS 0901 AND UP                                         00003500
            C                                                               00003510
ISN 0224          IF(ND.EQ.0) GO TO 5543                                    00003520
ISN 0226          DO 5544 JI=1,ND                                           00003530
ISN 0227          READ 5547,M,I,N,J,CDUM                                    00003540
ISN 0228     5547 FORMAT(2(I2,I3),E10.0)                                    00003550
ISN 0229          DO 5544 IJ=1,NB                                           00003560
ISN 0230          IF(I.EQ.IG(IJ).AND.J.EQ.JG(IJ).AND.M.EQ.MG(IJ).AND.N.EQ.NG(IJ))   00003570
                 1 CBAR(IJ) = CDUM                                          00003580
```

Subroutine 'INPUT'